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# AXIS CAPABILITIES AND INTENTIONS REGARDING THE MEDITERRANEAN.

OFFICE OF STRATEGIC SERVICES
Research and Analysis Branch
27 November 1942

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# AXIS CAPABILITIES AND INTENTIONS REGARDING THE MEDITERRANEAN

A. Spain and Portugal

B. France

C. Italy

D. The Balkans

E. Tunisia and Tripolitania

F. Turkey

General Appendix: Weather in the Mediterranean.

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Research and Analysis Branch
20 November 1942

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## SECTION A.

### Axis Capabilities for Movement Through Spain and Portugal.

## 1. TERRAIN

### A. Terrain in Southern France

Terrain in formerly unoccupied France is not likely to create any notable difficulties for Axis military movements in the direction of Spain and North Africa. Four topographic regions might act as barriers to mechanized movement: 1) the Pyrenees 2) the hilly margins of the Central Massif 3) the French Alps and 4) the Provence hills. The Central Massif is easily skirted on the west through the broad Aquitaine Basin, and on the east by the relatively wide Rhone-Saone corridor. Both lowlands offer easy routes and maneuverable areas adjacent to the routes. Together the French Alps and Provence hills render movement toward Italy somewhat difficult, and would presumably limit it to established peripheral and transalpine routes. These, however, are well enough developed to afford an effective secondary supply route to Italy from France.

The real barrier to movement southward is the Pyrenees range, which can be passed effectively only by sea. The two established land routes across and the two around this great range represent the limits of possible military movement by land toward Iberia. (See section on Spanish and Portuguese Terrain). We may therefore expect that any land action by Germany against the northern Spanish frontier will have to be supplemented by flanking movements on the Bay of Biscay and the Mediterranean.

## B. Spanish and Portuguese Terrain

The Spanish peninsula (with Portugal on an outer rim) is a great table-land, or "meseta", rising sharply from a very narrow coastal lowland in places, but in many cases abruptly from the sea. This table-land is nearly three thousand feet above sea level throughout, and is separated from the rest of Europe, first, by the Pyrenees Mts., extending across the base of the peninsula and leaving only a narrow passageway between the sea and the ends of the mountain range; and secondly by the trough of the Ebro River, south of, and roughly parallel to, the Pyrenees. This valley, only six hundred feet above sea level half way up its length, furnishes a barrier only in that to descend into it from the high French frontier requires a second climb to the meseta, at its highest here on its northern margin.

Great areas of the meseta are relatively level but the table-land is interrupted here and there by mountain ranges rising sharply still higher. The most significant of these higher massifs surmounts the north-eastern edge of the meseta, above the Ebro valley; road and railroads crossing here must climb to more than 3000 feet. An extension of these mountains extend south-westward just north of, and 150 miles to the west of, Madrid. Here again, roads from the north - rail or highway - must climb to over 3000 feet and then drop down to the meseta level.

Another tumbled mountain mass, the highest peak surmounting the highest point in the Pyrenees, rises steeply from the south coast, extending from

Gibraltar into the promontory, Cape Nao, with traces of its further extension eastward showing in the Balearic Islands. This effective barrier would be devoid of roads of any kind were there not minerals to be got out.

To these barriers disrupting progress across the meseta must be added the deeply entrenched streams which, cutting stream valleys down to the sea, in comparatively short distances, from mountain heights of six thousand feet, cut deep arroyos across the table-land in their upper lengths, and great canyons as they near the edge of the meseta.

Wide stretches of the meseta are scantily populated - first, because of inhospitable mountains; secondly, because of infertile soil, found in large areas; thirdly, because of drouth in the growing season (common to most of the meseta).

In winter, mountain passes and parts of the northern meseta are affected by snow, temperatures drop sharply at night, and winds are apt to be high and bitingly cold. In spring and fall occasional torrential rains make fields and dirt roads deep with mud. In summer, winds across the table land pick up dust and the heat is stifling. Water is a scarce commodity on the meseta; in many towns there is but the one town well; in great rural distances there is no drinking water at all between these occasional town wells, since farm houses are lacking. In summer, even most of the arroyos or upland streams are dry.

A movement across Spanish territory from France to southern Spanish coastal positions or to Spanish Morocco involves (1) crossing or skirting the Pyrenees and, in almost all cases, (2) climbing to an altitude of 3000 feet, plus, on the Spanish meseta.

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### C. Portuguese Terrain

Reaching Portugal by land, either by rail or highway, is only a matter of distance plus descent from the meseta. There are no intervening mountains in the rough terrain separating Portugal and Spain: on the other hand, all but two of Spain's major streams drop down from the meseta to the Portuguese coast, affording graded routes from one to the other. The two chief cities in Portugal are located at the mouths of two of these streams, and railroads and highways following down the streams from Spain, jointly lead directly to these and other cities as well as to the Portuguese coastal railroad.

The Portuguese terrain between these lines of ingress from the meseta and back of the coastal plain is extremely broken, especially in the northern two-thirds of the country. The coastal plain, as a whole, is wider than any in Spain, but once crossed from the sea, the mountains rise in a steep, broken escarpment which is the western front of the meseta and reaches an altitude of three thousand feet (in the northern two-thirds of the country) within a few miles of the coastal plain. This face of the meseta is chiefly of granite; the mountains, and even the upland valleys, are rugged and rocky. Great boulders are scattered about; cliffs, trending in all directions, rise sharply from intermontaine valleys that may be sparsely cultivated. Towns are few and far apart and roads are second rate when not actually primitive.

In the southern third of the country the coastal plain is much wider, the rise to the meseta is more gradual and much more generally covered with soil, and very little of the land is more than 1500 ft. above sea level. On these long slopes there is cultivation of grains where soil permits; elsewhere cork oaks are widely spaced in groves through which tanks could move as easily as the native goats and pigs. Here an army could pour down from the Spanish border without dependence on roads.

## 2. CLIMATE AND WEATHER

A. See Part I, B - Spain and Portugal, Climate and Weather.

## B. Weather conditions in Spain, Spanish Morocco, and Algeria*

### Conditions at Axis Bases

Southeastern Spain is climatically the best-suited to serve as a base for winter attacks upon Spanish Morocco. Rains here create the least difficulties of land transport, for this is the driest part of Spain. In addition, there is a distinct midwinter break in the rainy season, with only about 1/2 inch of rain falling in the driest winter month, January, and only 4 or 5 days with rainfall. For air operations, too, the climate of the southeastern coastal area is ideal: splendid visibility and comparatively little cloud or fog. Visibility at Cartagena, for example, is below 2 nautical miles only one morning a month in winter on the average, and less than one afternoon. December cloudiness amounts to only 32%, and fog is expected less than once a month.

These favorable conditions prevail in the entire coastal area from Malaga to Cartagena, but are most intensely developed in the vicinity of Almeria, the driest part of the area. Northward and westward from southeastern Spain, conditions of rainfall and visibility are somewhat less favorable, though in all of the Spanish south and east coast serious difficulties are not likely. At Valencia and Barcelona a distinct midwinter lull in rainfall persists, but west of Gibraltar heaviest rainfall is concentrated in December and may cause ground difficulties. Portugal has more rainfall, fog and cloud than the Mediterranean coast of Spain, and is thus less-suited to serve as a base.

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*For additional details, see maps and text in the Climate and Weather Appendix

## Weather Conditions Along Axis Supply Routes

The coastal rail and highway connections with France via the low-level route east of the Pyrenees is open all year, and is the only entirely dependable land supply route. Routes via the interior may be blocked by snow occasionally above levels of 3000 feet. Passes over a mile high in the Pyrenees are closed from November to May, and the Cantabrian passes are blocked from time to time from December to March.

## Conditions at Sea

Along the coast of Spain, winds are fairly favorable to departing vessels much of the time in winter, with northwest, west and southwest winds prevailing. In the long corridor east of Gibraltar between North Africa and Spain, winds are prevailingly from the west and east in winter, and attain gale velocities 2 or 3 times a month in winter. Along the Moroccan coast, west winds prevail, though east winds are also frequent.

## Conditions at Axis Objective Areas

Sea conditions highly favorable for landing prevail about two-thirds of the time along the coast of Spanish Morocco and nearby Algeria. Of the few points for which data is available, Melilla has the most favorable landing conditions, as the following data indicate.

| | Number of days sea calm or slight, Dec. to Feb. | Number of days sea rough, Dec. to Feb. |
|---|---|---|
| Tangier | 58 | 19 |
| Melilla | 65 | 12 |
| Oran | 49 | 27 |

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Of the two ends of the coast along the Riff Mountains, the eastern offers far the better land and air conditions in winter. Near the Algerian border, in fact, is the driest and least cloudy portion of the entire north coast of Algeria and Spanish Morocco. The Tangiers side is much wetter, and the Atlantic coastal plain of Morocco is frequently converted into morass by floods and by heavy winter rains, which attain their maximum intensity in November.

Real fog is more prevalent on the Atlantic than the Mediterranean coast, though not frequent at either. Cloudiness averages about 50% on the Atlantic coast; between 3 and 4 on the Mediterranean.

Altogether, climate favors air operations more than land operations in Spanish Morocco in winter. For both land and air operations, the most favorable section of Spanish Morocco for attack is the eastern end of the Mediterranean coast.

## 3. HEALTH CONDITIONS

### A. Spain.

Health conditions in Spain are poor. Malnutrition has lowered the general level of resistance to disease. Medicines are scarce and sanitary facilities inadequate. The shortage of soap and clothing has fostered the spread of louse-borne typhus, which last year reached epidemic proportions. With the coming of winter, typhus will again very probably constitute a serious problem. Tuberculosis has increased among the poor. In the southwest, malaria, carried by anopheline mosquitoes, is prevalent. Tropical diseases, brought from North Africa, are also encountered in the south. Throughout Spain, venereal diseases are widespread and insufficiently combated.

The population, in its present condition, is peculiarly susceptible to nutritional and infectious diseases. There is no doubt that an invading German Army would have to be well and self-sufficiently equipped with medical supplies, food and soap in order to maintain the health of its troops.

### B. Portugal.

Poverty and its attendant dietary deficiencies have made the general health level of Portugal poor. Conditions, however, are improving. The public medical service is not good, nor is the level of medical knowledge high among practitioners. Hospitals are insufficient.

The most serious disease is tuberculosis. Venereal diseases are prevalent.

## 4. COMMUNICATIONS

A major problem for the Germans, if they enter Spain, will be transportation. In neither Spain nor Portugal are the railroads adequate for continuous, heavy traffic. In Spain transportation facilities are at present unable to care for the ordinary economic needs of the populace.

Overland access to Spain is limited by the Pyrenean barrier. Although there are actually four railroad and four highway connections between France and Spain, the bulk of the traffic is carried through two points, one at the Biscayan and the other at the Mediterranean end of the Pyrenees chain. These two routes are vulnerable points and transportation bottlenecks. A difference in gage between the railways of France and Spain obliges the transfer of goods at the frontier.

The deviousness and inadequacy of the railroad lines within the Peninsula form another obstacle to rapid military movement. Neither the road nor railroad networks were designed for an advance from the north toward the southern coast of Spain. Roads, railroads, and telephone lines all converge upon Madrid, from which they radiate out again to all the corners of Spain. While both a railroad and a highway go south along the Mediterranean coast, neither is designed for heavy, direct traffic. The main railway south from Irún reaches Madrid deviously. There is no such thing as a line direct from Irún to the Straits.

The inadequacy of the railroad network is aggravated by present deficiencies in rolling stock. Spain and Portugal having a 5 foot 6 inch gage, the Germans can accumulate locomotives and freight cars from other European countries only if they adjust the railway gages. Under present conditions they would have to use the rolling stock available in the Peninsula. In Portugal this rolling stock is outdated and increasingly decrepit. In Spain the heavy losses of the Civil War - partially but not completely made good - have left the supply well below normal. A high percentage of rolling stock has led to the overuse of existing material, with resulting breakdowns and accidents. Fuel and lubricant scarcities contribute further to its deterioration.

Because of the deplorable state of Spanish railways, the Germans would have to rely heavily upon the system of highways. The condition of the principal Spanish and Portuguese roads is fair. The Civil War did not seriously damage the roads in Spain; the network which Primo de Rivera had constructed in the '20's still remains the backbone of the Spanish system. None of these Iberian trunk highways, however, approach the arterial highways of the United States and Germany in traffic capacity. They were not designed for the volume of traffic which has become commonplace around big American cities. Almost none can take two-way military traffic except in stretches. The Spanish road network, moreover, was not intended, any more than the railroad network, to carry heavy traffic from France to southern Spain.

A greater obstacle to German motor transport would be the necessity of bringing along supplies of gasoline. Vehicular traffic in both countries has been reduced to a minimum, as the inflow of gasoline is severely restricted and reserves are very small.

Telephone wires in Spain for the most part follow the highways. The Spanish telephone system is good, but except for lines running through Salamanca in the west and Valencia in the east, the only north-south telephonic communication is through Madrid. If the six main routes through which 325 talking channels emanate from Madrid were to be disrupted, communications might be seriously disturbed.

The telegraph system, with 85,000 miles of wire in Spain, is of less value than the telephone network. In Portugal, where the telephone system is not very good, there were 14,700 miles of telegraph wire in use in 1938. Inadequacies of the Iberian communication system could no doubt be quickly remedied by the Germans, unless they are suffering from a shortage of equipment.

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## APPENDIX

### (1) Railroads and Roads through the Pyrenees

The formidable mountain barrier of the Pyrenees between France and Spain imposes serious transport problems. The main railroad lines skirt the mountains in the low coastal regions to the east on the Mediterranean and to the west on the Bay of Biscay. Both at the Port Bou-Cerbère frontier crossing at the eastern end and the Irun-Hendaye frontier crossing at the western end there are double track lines, electrified in the case of the latter. The two usable subsidiary lines have steeper gradients, more curves and are single tracked. One crosses the frontier at Canfranc and the other, which is electrified, at San Juan-Puigcerdà. There are four principal highway crossings of the frontier. The first is from Perpignan to Figueras, and it is one of the best routes. Crossing the Pyrenees at le Perthus at an elevation of 298 m. (997 ft.), it is wide and paved, with few curves and low grades. On the French side of the border there are more curves and steeper grades, although the latter never are greater than seven percent. Heavy snow can probably be removed from this pass quickly. The second is by way of the pass at Bourg-Madam-Puigcerda. It has an elevation of 1130 m. (3706). Approaching Spain the road has sharp curves and grades as steep as twelve percent. In Spain it branches into two first class highways, one leading to Lerida and the other to Barcelona. This pass in normal times is closed by the winter snows from December to March. The third route is between Oleron-Jaca, through the Somport pass at an elevation of 1632 m. (5353 ft.). The road on the French side and through the pass is narrow, curving and with grades up to twelve percent. On the Spanish side the road is much better in every respect. The pass is closed to vehicular traffic from November to mid-May. The fourth crossing, on the Bay of Biscay side, is through Hendaye-Irun and ranks with the first, at le Perthus, having excellent paving and width. On the other hand, although it reaches no great elevation, it has many curves and grades as steep as twelve percent.

(2) Railroads of Spain and Portugal

The complex railroad system of Spain is geared, so far as topography will allow, to the two main lines which run to Madrid from the Bay of Biscay and Mediterranean ends of the French frontier. The inevitable use of these routes by an invader would give him the prime objectives of both Barcelona and Madrid. The first of these lines begins at Irun-Hendaye (the Spanish broad 5'6" gauge runs into the Hendaye yards) and passes through S. Sebastian, Alsasua, Burgos, Venta de Banos, Valladolid, Medina, Avila, and Villalba to Madrid. It is the shortest and best route to Paris, and to it are connected most of the essential linking lines of northern Spain. The distance between the frontier and Madrid is 640 kilometers. It is double-track all of the way, except for a distance of 105 kilometers between Alsasua and Miranda. It is electrified between Hendaye and Alsasua, a distance of 105 kilometers, and between Avila and Madrid, a distance of 121 kilometers. The gradients on this section are from 2.2 to 2.4 percent. Crossing over the frontier into Spain the line passes through a series of tunnels to Victoria, then over a broad plateau to Avila where it works its way through the Guardarrama mountains before entering Madrid.

The second main line from France to Madrid which would be heavily used in invasion, begins at Port Bou, at the Port Bou-Cerbère frontier crossing and runs a distance of 854 kilometers. The first section is from Port Bou to Barcelona, a distance of 169 kilometers, and is double-tracked all the way. Near the frontier the right of way is occasionally flooded during the heavy rains. There are two supplementary routes part of the way, one through Granollers and the other through Mataro and Arenys del Mar. Both of these are single-tracked. The second section, from Barcelona to Madrid by way of San Vicente de Calders, Roda, Reno, and Caspe, is 685 kilometers long. It is single-tracked except between Barcelona and San Vincente de Calders (66 kilometers), Zaragoza and Morata (68 kilometers) and Baides and Madrid (124 kilometers). The trackage between Calatayud and Baides is known to have been in the process of being doubled in 1941.

The railroad route along the expected direction of invasion from the Port Bou-Cerbère frontier down through the string of Mediterranean ports from Barcelona to Algeciras, Cadiz and Huelva is not double tracked beyond S. Vincente de Calders except in the Valencia district. The utilization of this line could only be secondary. While fairly ready access could be had to Madrid, mainly over the Irun-Hendaye entrance, double-tracked most of the way, the supplementing of the Mediterranean coastal route would find serious bottlenecks where that line and those from the interior use the same single tracks at such places as between La Encina and Villena, between Moreda and Guadix, and between Marchena and Utrera. In addition serious complications would develop at the many cross-over and junction points.

Since the coastal line would have to be constantly bolstered from the Madrid base, in spite of the difficulties just mentioned, and because the lines of Spain depend on that city, it is best to describe the remaining strategic rail routes from the viewpoint of the interior.

From Madrid there is a line to Alicante (455 kilometers), double-tracked to Albacete (279 kilometers) which connects with the line more or less following the coast down from San Vicente de Calders. The latter, which passes through Tarragona and Valencia would undoubtedly be an outside line of invasion, is double-tracked only between Valencia and Jativa (56 kilometers). From the Madrid-Alicante line a single track connection branches off at Chinchilla and runs to Cartagena. Between Murcia and Alquerias this uses the same track as the single line paralleling the coast south-west from Alicante to Granada. This particular line, a key route of invasion, has a serious bottleneck in the mountains between Lorca and Huercal-Overa where steep grades (2%) and sharp curves greatly reduce the loads which can be carried. Branching off from the Madrid-Alicante route at Alcazar de San Juan while it is still double-tracked, and itself double-tracked to Valdepenas (225 kilometers from Madrid), is the main line to Cordoba and Seville. The final section between Lora del Rio and Seville (56 kilometers) is also double-tracked. From this important line there are single-track connections with Almeria, Granada, Bobadilla, Malaga, Cadiz and Huelva. There is also a railroad route from Granada through Bobadilla to Seville. There are several lateral lines which are essential to a cross-linking of the "invasion" rail routes for utilization in the event of stoppage or over-load. One of these is the single track line from Valencia through Calatayud to Burgos, connecting the coastal line with both of the trunks to Madrid from France. Another is the single track line from Huelva through Zafra, Salamanca and Zamora to Coruña-El Ferrol. This line flanks Portugal and links together all rail routes into that country.

The Irun-Madrid main line is the railroad key to Portugal, should it be the invader's intention to occupy that country. The through trains from Paris branch off at Medina del Campo and go by way of Salamanca to the junction at Bobadilla-Fuente de S. Esteban. From there they proceed to Oporto or Pampilhosa. Pampilhosa is on the double-tracked trunk between Oporto and Lisbon, which is the only double-tracked line in Portugal. Even it has two short single-tracked sections: the bridge at Oporto and the link between Albergaria and Chao de Macas. The line coming in at Pampilhosa from Spain is used not only by trains running from France to Lisbon, but also by those from Madrid to Figueira da Foz and Oporto. The direct route from Madrid to Lisbon runs by way of Empalme da Plasencia and Valencia de Alcantara to Entroncamento on the Oporto-Lisbon trunk line. There are also connections from Cordoba and Seville in Spain by way of Badajoz and Torre das Vargens to Lisbon and Oporto.

It is extremely difficult to estimate the capacity of the railroads of Spain, since all the normal standards are invalid in this case. The following inventory of rolling stock for Spanish broad gauge railroads as of January 1, 1942, published in a recent report by the Railroad Materials Commissariat, points to another deficiency:

| | Locomotives | Passenger Cars | Freight Cars |
|---|---|---|---|
| Operating since 1936 | 2,800 | 4,383 | 69,222 |
| Operating since 1939 | 1,837 | 1,740 | 41,700 |
| Operating since 1942 (1.1) | 2,475 | 2,810 | 64,997 |
| Decrease from 1936-1942 | 325(11.60%) | 1,567(35.75%) | 4,225(1.10%) |

In the light of facts the maximum capacity of the single track lines would probably be 12 trains each way per day, and of the double track lines 36 trains. This could be kept up for no more than ten days. The maximum maintainable capacity would fall to 8 and 24 to 30 respectively. Train loads are again difficult to estimate because of the varying gradients on the different railroads of Spain, but the average maximum train would be of from 25 to 30 cars of 12 tons capacity each. This would place a net load of from 300 to 360 tons for each train. This in turn would make an over all emergency daily one-way capacity on single-track lines of 4320 tons and on double track lines of 12,960 tons. This would have to be reduced by 30 percent because of the bulk of military stores, and probably still further because of the highly conjectural nature of any estimate of Spanish railroads by formula.

Everything which has been said about Spanish railroads could be repeated for the Portuguese lines. The estimates on the size of loads and on trains per track are the same. On the condition of the rolling stock on standard broad gauge railroads a recent British Naval Intelligence report, after stating that the Portuguese railroads have greatly deteriorated since the beginning of the war, gives the following figures:

| | |
|---|---|
| Engines with separate tenders | 302 |
| Tank Engines | 115 |
| Steam-propelled composite coaches, with engine, 2nd and 3rd classes and van | 2 |
| Electric composite coaches, with motor-unit, 1st and 2nd classes. | 10 |
| Idem, plus 3rd class | 2 |
| Miscellaneous passenger coaches | 960 |
| Freight cars | 7,791 |

### (3) Roads of Spain and Portugal

The use of the roads of Spain by an invading force from France offers a far more usable and rational approach than the railroads. There are trunk roads which sweep down across Spain in the natural south-westerly direction which any invader would of necessity employ.

Beginning near the eastern end of the Franco-Spanish border with the Perpignan to Figueras road carried through the Pyrenees at the beginning of this appendix, there is a good highway running down the Mediterranean coast of Spain leading to all of the ports between Barcelona and Algeciras and around to Cadiz. There are many bridges between Motril and Cadiz. This route would be subject to bombing from the Mediterranean and/or North Africa throughout its length. From the Hendaye-Irun crossing of the frontier an excellent road (exposed to bombing from England) runs to Ameyugo, where it is joined by a curving and at times steep road from the port of Bilbao, which in an emergency might be used as a feeder, and passes on to Burgos, where it meets a rather twisting road from Santander, which might be put to the same purpose as the one from Bilbao. From Burgos one highway, good, but occasionally curving, narrow and steep goes directly south to Madrid, while another runs by way of Tordesillas and Salamanca to Portugal, should it be the intention to occupy that country. This route recently has been rebuilt. As noted at the beginning of this appendix, there are two other usable highway frontier crossings at Bourg-Madam-Puigcerda and at Oleron-Jaca. The gradients, curves, numerous bridges and winter snows reduce the usefulness of these routes, but they are nevertheless important. They join together at Zaragoza and proceed to Madrid over a national artery, which, however, has many bridges. Continuing beyond Madrid in the same general direction there is a highway which goes to Merida. From Merida Portugal may be invaded via Badajoz. This route has been given special attention by German engineers. South of Merida a road goes to the port of Huelva, passing through Jabugo from which another road leads to Portugal. Returning to Madrid, a national arterial highway leads south to a junction at Bailen. From this point one road runs to Granada and Malaga, while another goes to Cordoba, Seville and Cadiz. Both of these pass through mountainous country.

There is another inland invasion route, not indicated as such on most maps, which could be of considerable importance. Throughout its length it is not generally as good as the main national highways, but its quality is not secondary, and it runs in the proper southwesterly direction. More significantly, its use would relieve the bottleneck at Zaragoza created by the union there of the invasion roads from Huesca and Lerida. This route begins at Bujaralos and ascends with difficulty over the mountains by way of Alcaniz, Teruel, Utiel, and

Albacete to Jaen. Nevertheless, by connecting these points it provides a road paralleling the Mediterranean, 50 to 100 miles inland, running some two-thirds of the length of Spain. It is the only inland route east of Madrid. Should the port of Valencia be used by the invader, the easier southern portion of this route can be reached from Valencia by way of Chiva and Requeña on the main road from Valencia to Madrid.

The important lateral roads in Spain, beginning in the northeast are as follows:

1. From Puigcerda to Barcelona
   Curving and steep.
2. From Lerida to Barcelona.
   Curving, sharp grades and bridges.
3. From Ruesca to Lerida to Tarragona.
   Curves, tunnels and bridges.
4. From Pancorbo to Zaragoza.
   Winding and sharp grades.
5. From Alcaniz to Castellon de la Plana.
   Curving, and toward Castellon mountainous.
6. From Tordesillas to Madrid.
   Sharp curves and grades.
7. From Madrid to Valencia.
   Twisting, steep and many bridges.
8. From Ocana to Albacete to Murcia to Cartagena.
   Excellent, paralleling railroad most of way.
9. From Granada to Almeria.
   Curving and mountainous.
10. From Granada to Motril.
    Numerous bridges.
11. From Cordoba to Malaga.
    Extremely winding.

The roads of Portugal are based on the main route between Oporto and Lisbon. All of the possible invasion roads lead to that highway. Beginning in the north, the first and most likely line for an invader to use, runs from Salamanca to Cuidad Rodrige in Spain and crosses Portugal to a joining with the Operto-Lisbon road at Coimbra. From that point it also continues on into Figueira de Foz. This road is reported as being in good condition. To the south, the direct route from Madrid is by way of Trujillo, Merida, Badajoz, Estremos, and Montemor-o-Novo to Lisbon. This route, like all approaching Lisbon from the south, makes necessary the use of ferries to cross the Rio Tejo (Tagus River) before entering the city. The condition of this road is generally good. There is a good alternative route branching off at Trujillo through Caceres and Valencia de Alcantara which rejoins the Badajoz road at Estremos. There is still another alternative south of the Badajoz road branching off the Merida-Huelva road at Zafra and joining the Badajoz road before Lisbon at Montemor-o-Novo. Finally the most southern route of first importance begins at Jabugo on the Merida-Huelva road and goes by way of Rosal de la Frontera, Beja and Ferreira to Lisbon. This road, while generally good, is of poorer quality between Jabugo and Beja. On the southern coast there is a road from Huelva into Portugal, but the river crossing at Ayamonte has to be made by ferry. This route, although circuitous, connects with Faro, Lagos, Sines and Lisbon. While much of it is classed as secondary, it is of generally good quality, and has many parallel supporting routes.

(4) Capacity of Railroads and Highways

On the basis of the best possible means of land access to the Iberian peninsula, both rail and road, it has been estimated 1.69 German infantry divisions plus appropriate GHQ forces and 10 days' supplies could enter Spain per day. This is through the passes at the two extremities of the Pyrenees. Lesser additional units could flow, weather permitting, through the inland railroad and highway passes. However, it should be remembered that, as formidable as the frontier barrier may be, there are other bottlenecks besides those in the Pyrenees. In Spain it is not axiomatic that the rail system could effectively distribute incoming traffic as rapidly as it entered the country. This would be doubly true if invasion came partly by sea, further congesting the railroads near sea ports. The difficulty is far less serious with the highway system.

## 5. VITAL AREAS

Vital areas in Spain over which the Germans would seek the earliest possible mastery are: (1) the various Pyrenean passes leading into Spain; (2) the Balearic Islands; (3) Barcelona, with its port, industrial establishments and aerodromes; (4) the Tremp region with its hydroelectric plants; (5) the mountain passes through the Cantabrian Mountains leading to the northwestern seaports; (6) Bilbao, with its harbor and industrial establishments; (7) the mountain passes north of Madrid; (8) Madrid, of value industrially, psychologically, and because it is the communications and administrative center of the country; (9) the routes descending from the central plateau into Portugal; (10) Vigo Bay; (11) the Guadalquivir Valley, as it is the easiest route for the northward advance of a force based on Africa; (12) the ports of the Mediterranean; (13) railroad or highway junctions such as Lérida, Saragossa, Miranda de Ebro, Burgos, Medina del Campo, Salamanca, Ávila, Calatayud, Reus, Albacete, etc.; and, (14) last but not least, the fortress of Gibraltar.

Vital areas in Portugal at which the Germans would aim are: (1) the Lisbon-Setúbal area, where there is the greatest concentration of people, port facilities, government offices, commercial establishments and transportation termini; (2) the Porto-Leixoes area; and (3) the Algarve, which, as it is the section of Portugal nearest to Africa, would be an obvious approach, via the ports of Faro and Lagos, for a force coming north to resist the Germans.

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## 6. PORTS AND NAVAL BASES

In the initial stage of a thrust through Iberia, the harbors of northeastern Spain could be used by the Germans for the transport of troops and supplies from southern France. Barcelona, Tarragona, Valencia, and Alicante offer unloading facilities by which the invader could augment by possibly 60% the volume of traffic coming overland by rail and highway at the Mediterranean end of the Pyrenees. Barcelona has an estimated daily capacity of about 10,000 d.w. tons. The estimated capacity of Alicante is 6000 tons and of Valencia 4000 tons.

At greater risk of sinkings, the Germans could also run ships from Bordeaux to Bilbao and Santander to supplement the overland route at Irún. There are other excellent ports along Spain's northern coast, but Bilbao, with an estimated daily capacity of 8000 d.w. tons, and Santander would probably, as the ports nearest to France, suffice for the ships employed in Biscayan waters.

In moving troops and supplies from Spain to North Africa, the Germans would seek the shortest possible sea route. To do this they would have to use southern Spanish ports of considerably smaller capacity than the northeastern ports, but nevertheless superior in capacity to the North African ports.

From west to east, the leading southern Spanish ports and their estimated daily capacities are:

| | | | |
|---|---|---|---|
| Huelva | 4800 tons | Málaga | 4400 tons |
| Sevilla | 4700 tons | Almería | 3600 tons |
| Cádiz | 2600 tons | Aguilas | 1000 tons |
| Algeciras | 2000 tons | Cartagena | 5200 tons |

In addition to these, some use might be made of the smaller ports of Marbella, Motril, Adra, Denia, and Gandia.

Should an attack be directed at the north Atlantic coast of Morocco, Portuguese seaports might be employed to supplement Cádiz and Huelva. The two small southerly ports of Lagos and Faro-Olhâo would be of little use, but Lisbon, with an estimated daily capacity of 8,900 tons, and Setúbal, with a capacity of 1500 tons might be employed.

## APPENDIX

### (1) Selected Spanish Ports
(arranged from west to east to north)

**Huelva:**

General: 10 mile estuary between bar and port. Depth on bar 20 to 31½ ft. (spring) and 25-26½ ft. (neap). Channel across bar, 656 ft.

Accommodation: 19 ships at mooring-buoys, 11 ships at berths alongside, plus 8 berths at mineral jetties. Largest ship accommodated to date 17,600 tons (loading).

Wharfage: 7,050 feet long, 60 to 70 ft. wide, except Muelle Defenitive which is 280 ft. wide. Depth varies at L.W. from 5 ft. (at most shallow point at Muelle Norte) to 25 ft. Usual depth varies from 18-25 ft.

Cranage: 41 steam, electric and hydraulic cranes. 4 cranes are each of 15 tons capacity, all others from 2-6 tons capacity.

Estimated Capacity: Annual traffic (1933) 2,244,482 tons (mostly ore). Daily capacity is estimated at 4,800 tons.

Storage Facilities: Warehouses limited.

Facilities for clearing port area: Rail-broad gauge, 1 track, to Seville.

Rail-broad gauge, 1 track, to Zafra.

Rail-narrow gauge-private, to mines at Rio Tinto and Tharsis.

Roads-good to Seville and Gibraleon.

**Cadiz:**

General: Most important commercial port in S. Spain, recently an important potential submarine base.

Accommodation: In bay, to N.E. of port, anchorage for at least 50 ships - in 30 ft. of water with good holding ground, mud. Port accommodates 8 or 9 medium-sized ships of about 4,000 tons alongside. No. of berths: 9.

Wharfage: 7,516 ft. long; width 328 ft.; depth at L.W. 4-18 ft. at Muelle de San Felipe, at all other docks and quays from 22-30 ft.

Cranage: 8 steam and electric cranes with capacity from 1-5 tons, plus 3 thirty to 100-ton sheerlegs, 9 three to 10-ton travelling cranes and 1 six-ton hand crane.

Estimated capacity: Annual traffic 174,535 tons (1933). Daily capacity 2,600 tons.

Storage Facilities: Limited.

Docks and Slipways: 5 slipways accommodating ship of 10,000 tons; 6 dry docks.

Facilities for clearing port area: Rail- broad gauge, 1 track later becoming double track to San Fernando. Rail - alternate - bad narrow gauge; 1 track joining main railroad.

__Algeciras__:

General: Anchorage in line outside breakwater has depth of 60 ft. Inside breakwater, from 35-50 ft. Length of breakwater, 4,200 ft.

Accommodation: 7 ships alongside at quays, 3 at outer breakwater, 6 ships at anchor inside breakwaters. No. of berths: 8.

Wharfage: 8,850 ft. long, width 200 to 360 ft., depth at L.W. varies from 11-54 ft.

Cranage: 3 travelling cranes, 1 of 100 tons others 5 and 10 tons.

Estimated capacity: Annual traffic 33,846 tons (1938), daily capacity 2,000 tons.

Storage Facilities: 2 medium-sized sheds and stacking space.

Docks and slipways: 1 for ship up to 200 tons.

Facilities for clearing port area: Rail - broad gauge 1 track to Bobadilla. Road - narrow road, single traffic to wide main coast road.

Sevilla:

General: Sevilla is 54 miles up the Guadalquivir. The river channel is 262 ft. wide, 17 ft. deep to Sevilla... ships of 20-22 ft. draft and 413 ft. in length can use it.

Accommodations: 9 to 10 large ships; many small ships at old quay. No. of berths: 10.

Wharfage: 11,420 ft. long; depth 14-17 ft. at old quay but 20-21 ft. other areas.

Cranage: 28 cranes of 3-10 tons capacity, plus hand crane of 30 tons capacity.

Estimated Capacity: Annual traffic (1933) 719,480 tons; daily capacity at all (except the old quay) quays 4,700 tons.

Storage Facilities: 10 large sheds on old quay. Several large sheds on other quays.

Facilities for clearing port area; Sevilla is an important railway center. Rail lines along all quays. Two 1st-class roads S. to Cadiz, E to Cordoba, N. to Merida and Madrid; 2nd class road W. to Huelva.

Málaga:

General: Excellent harbor formed by two moles from which extend two transverse moles forming an inner and outer harbor. Passage from one into other is 410 ft. wide and from 27-32 ft. deep.

Accommodation: 9 - 12 medium-sized ships at quays, plus anchorage for several other ships in the harbors. Can accommodate 15-20 small ships of 300 ft. length at quays. No. of berths: 9-12.

Wharfage: 6,300 ft. long, depth at L. W. 17-24 ft.

Cranage: 7 electric travelling cranes of 4 tons capacity, 2 of 15 tons capacity.

Estimated Capacity: Annual traffic, 492,195 tons (1933); daily capacity 4,400 tons.

Storage Facilities: Several storage sheds and ample stacking space.

Docks and slipways: 1 floating dock, 229½ ft. x 46 ft., to lift 1,700 tons.

Facilities for clearing port area; Good road and railroad facilities to be used as exits to interior. They are however restricted by railroad and road bridges.

Motril:

Provides safe anchorage inside its port. The depth of water in the harbor is 26 ft. Estimated daily capacity, 700 tons.

Adra:

Has an open roadstead and a quay which will shelter 2,000-3,000-ton vessels from westerly weather. Estimated daily capacity, 600 tons.

Almeria:

General: Port is outlet of an agricultural and mineral region. A fuelling base for oilburning ships of Spanish navy.

Accommodation: 10 ships alongside the quays (excluding mineral quays), 12 ships at mooring-buoys, 4 ships at anchor. No. of berths: 16.

Wharfage: 6,340 ft. long, 150-200 ft. wide, depth at L.W. 23-24 ft. with decreasing depth to 8 ft.

Cranage: Five 5-ton electric travelling, one 25-ton electric travelling, one 25-ton hand.

Estimated Capacity: Annual traffic 350,553 tons (1933), daily capacity 3,600 tons.

Storage Facilities: 8 large sheds and ample stacking space.

Facilities for clearing port area: By rail, broad gauge. 1 track to Guadix. Direct exit from port by main coast road and through town by other roads.

Cartegena:

General: Port enclosed except on S. side where there are two breakwaters of 492 and 2,500 ft. No tides. Harbor: water area, 305 acres, width at entrance, 1,640 ft., depth at entrance 32½ ft.

Wharfage: 3,600-3,900 ft. long; depth 24 ft. to 30 ft.

Cranage: 6 cranes of 1-1½ tons capacity, 2 of 4-6 tons capacity and 1 of 20 tons capacity.

Estimated daily capacity: 5,200 tons.

Docks and Slipways: 1 large floating dock to lift 3,500-4,000 tons; 1 floating dock for submarines to lift 1,150 tons; 1 dry dock accommodating 575 ft. ship; 1 launching dock to launch ship of no more than 2,000 tons. 1 patent slip for vessels up to 150 tons.

Facilities for clearing port area: Most quays are connected by rail to main line railroad to Madrid, branch to Monte Escucha and mineral railroad to Los Blancos.

## Alicante:

General: Port consists of outer and inner harbor, extensive quayage in outer harbor - eastern and southern arm 29-32 ft. deep, northern arm 13-16 ft. deep. Inner harbor 20-26 ft. deep.

Wharfage: 2,982 ft.long with varying depths as noted above.

Cranage: One 30-ton electric, one 25-ton steam and five 1½-10-ton capacity, and in addition there were 2 hand and diesel-engined floating cranes.

Estimated daily capacity: 6,000 tons.

Facilities for clearing port area: All wharves are connected with railway system. Good railway connections from Alicante to Madrid, Valencia and Murcia.

## Denia:

General: An artificial port 4½ miles N.W. of Cabo de San Antonio.

Port Facilities: Port formed by 2 breakwaters, each ½ mile long, making a triangle with opening of 100 yds. at apex. Depth 18 ft. 6 in.

Facilities for clearing port area: Narrow track railway runs along quayside to stations 300 yds. from shore. Two stations with lines to Alicante and Carcagente via Gandia. A junction between 2 stations.

## Gandia:

General: Gandia is 44 miles from Valencia. Harbor is 2 miles east of town, the center of the orange plantations.

Port Facilities: Port covers area of 1 mile x ¼ mile. Artificial harbor protected by 2 breakwaters with a narrow entrance. 14 ft. water depth within harbor. Warehouse space for 80,000 cases of oranges.

Cranage: One 6-ton and one 3-ton steam cranes.

Estimated daily capacity: 1,500 tons.

Facilities for clearing port area: 2 railway connections to port (1) railway to Alcoy (2) narrow gauge railroad to Carcagente, where it changes to broad gauge. The town is connected to main road from Valencia to Alicante.

Valencia:

General: Valencia is 3rd largest town in Spain but port is unimportant from Naval standpoint. Artificial harbor consists of an outer port and 3 basins protected by breakwaters. No bar at entrance and no tides. Depth at entrances to harbors vary from 36-49 ft. and depth of harbors vary from 26-36 ft.

Accommodation: No. of berths: 10.

Wharfage: 12,054 ft. long, depth alongside varies from 20-38 ft.

Cranage: Two electric cranes with capacity of 15 tons, eleven of 3-5 tons, and one 80-tons floating crane.

Estimated Capacity: estimated daily capacity 4,000 d.w. tons stores.

Storage Facilities: 6 large warehouses.

Docks and Slipways: 1 floating dock to lift 4,000 tons for ships up to 420 ft. 1 slipway up to 300 tons.

Facilities for clearing port area: Railway on wharves which are connected to the railway system. Mainline communication with Barcelona and Alicante and with Madrid via Albacete. A new, shorter line to Madrid under construction.

Tarragona:

General: Port artificially formed between 2 moles.

Wharfage: 4,168 ft.; depth of water alongside varies from

23-29 ft.

Cranage: Eight 3-ton electric cranes and four 5-ton electric cranes.

Docks and Slipways: 2 slipways 525 x 131 ft. and 525 x 52 ft.

Facilities for clearing port area: All quays have railway connections. From the town there is communication by rail with Alicante and Barcelona and also to Lerida and Saragossa.

Barcelona:

General: Largest and best equipped Spanish port in the Mediterranean. Port heavily damaged in Civil War and not completely repaired.

Wharfage: A total wharfage in all the outer and inner harbors of 5½ miles, with depth ranging from 26-36½ ft.

Cranage: Twenty-four cranes of 6 tons, eight of 3 tons and seven of 2 tons in addition to four floating cranes with capacities ranging from 25-80 tons.

Estimated Capacity: About 10,000 d.w. tons stores per day.

Docks and Slipways: A steel floating dock of 367 ft. to lift 6,000 tons; two patent slipways (400 ft.).

Facilities for clearing port area: Most of the quays are connected with the railway system. The town is connected by main line to Madrid, Bilbao and Valencia and France via Port Bou-Cerbere. The electrified line crossing Pyrenees at Puigcerda to connect with lines in France has been interrupted and at some points must be traversed by bus.

Bilbao:

General: A deep water-channel 8 miles long connects Bilbao to the sea. Best seaport in north of Spain. Bilbao bay, outside outer port is fairly well sheltered and could accommodate about 10 capital ships. Harbor consists of outer port 4,800 ft. x 3,000 ft., Protected by breakwaters, and a narrow river leading to Bilbao.

Wharfage: 11,907 ft. long, with varying depths from 10 to 28 ft. except for outer harbor in which the depth varies from 36-49 ft.

Cranage: Thirty-eight 1-6-ton cranes, one 10-15-ton crane, three 30-40 ton cranes in addition to two 100-ton floating cranes.

Estimated Capacity: About 8,000 d.w. tons stores per day.

Dry docks and Slipways: 4 dry docks of 330 ft. 6 in., 318 ft., 564 ft. and 426 ft. 6 in.

Facilities for clearing port area: Most of the quays are connected with the railway system.

Santander:

General: Santander is best harbor on north coast east of Cape Ortegal and of great importance on account of its trade and capacity. Mainly engaged in export of iron ore.

Wharfage: 10,882 ft. long, with depth alongside varying mostly from 13 ft. to 31 ft. although alongside a few quays depth varies from 6-12 ft.

Cranage: 20 cranes with capacity varying from 1-8 tons. Also one 30-ton crane. Steam and electric cranes.

Docks and Slipways: 2 dry docks, 455 x 57 ft. and 335 x 52 ft.

Facilities for clearing port area: Most quays connected with the railway system. The town has direct railway connection to Bilbao, Gijon and Madrid.

## (2) Selected Portuguese Ports

### Lisbon:

General: Located on n. bank of Tagus about 7 miles from its mouth.

Wharfage: North shore from Belem Castle (38°42'N, 9°13'W) to Santa Apolonia railway station, a distance of nearly 5 miles, is a continuous quay. Quayage - 24,086 ft. long. Depth alongside at H.W.O.S.T. varies from 30 to 44 ft., while at L.W.O.S.T. from 18 to 30 ft.

Cranage: Steam sheers to lift 60 tons, 59 steam and electric cranes of 1 to 6 tons capacity, 4 steam and electric cranes of 10 to 12 tons capacity and also two floating steam cranes to lift 100 and 45 tons respectively.

Estimated capacity: Daily capacity of about 8,900 tons. However, it is doubtful if more than 7,000 d.w. tons military stores per day can be landed and cleared.

Storage: Sizeable coal and oil storage capacity.

Docks and Slipways:

7 drydocks of 590, 361, 197, 147, 138, 250 and 200 ft. length respectively.

3 building slips for ships up to 1,000 and 4,000 and 8,000 tons respectively.

1 graving dock 315 ft. in addition to facilities of Portuguese Naval Arsenal of 4 building slips and 1 slipway which is capable of taking two destroyers.

Setubal:

General: Inlet of Setubal separated from sea by narrow tongue of sand and it opens out into a large estuary, extending over 10 miles south-eastward. River forms large natural bay, which at some points reaches depth of 130 ft. Off the town there is anchorage in depths from 30 to 42 feet. Access to port through narrow natural channel and by a new channel. Latter 300 ft. wide. Old channel depth 9 to 19 ft. New channel depth 15 to 23½ feet.

Wharfage: At the 4 quays a total length of 1,110 ft. with depths from 15½ to 20½ ft. above L.W.S.T. Commercial basin has 2 quays of 100 ft. and miscellaneous wharfage of about 270 ft.

Cranage: One 10-ton steam crane, two 1-ton hand cranes and two electric cranes.

Estimated daily capacity: At all quays and to lighters is 1,500 d.w. tons of military stores.

Facilities for clearing port area: #4 quay is connected with railway system.

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## 7. AIR BASES

### A. Spain

There are few airfields in Spain with first class concrete runways and equipment. Airfield development has not been intensive, although new fields have recently been constructed in the northwest. In the Gibraltar area landing grounds have been installed, but they are not first class operational bases.

In the whole of Spain there are, it has been estimated, 44 aerodromes with permanent facilities or at least runways, 32 fields with few or no facilities capable of being used if necessary by operational units, 57 emergency landing grounds, which are either small, badly situated, or have poor surface conditions, 4 seaplane stations and 7 seaplane alighting areas. Of the 44 aerodromes, only 13 have runs of 1400 yards and over. Of the landing fields with few or no facilities, 10 have runs of 1400 yards or over.

Within a radius of 150 to 200 miles of Gibraltar, the principal airfields in continental Spain are: Sevilla-La Tablada, Granada-Armilla, Málaga-Churriana, Sevilla-San Pablo, Jerez de la Frontera, Jaén, Sevilla-El Copero and La Roda. There is a seaplane station at Cádiz-Puntales and seaplane alighting areas at Huelva and Málaga. Throughout the area are numerous small landing fields. The soil in this region tends to become sticky when wet.

Eastwards along the Mediterranean littoral, there is a cluster of airfields in the triangle formed by the cities of Albacete, Alicante, and Cartagena. These are Albacete-Los Llanos, Cartagena-Los Alcazares, Alicante-El Alted, Alicante-Rabaza, Cartagena-San Javier, Torre del Negro, and Albacete-Los Alcazares. Three seaplane bases are found in the Cartagena area - Los Alcazares, San Javier, and Mar Menor. Further north on the Mediterranean coast at Valencia is the Manises aerodrome and also a seaplane alighting area.

On the Balearic Islands, strategically of great importance, the Son Bonet and Son San Juan airfields on Mallorca have been well developed. At San Juan and Pollenza are two other Mallorcan airfields of value. Seaplane bases on Mallorca are at Palma, Pollensa Bay, and Alcudia Bay. A seaplane station is established also at Port Mahon, Minorca.

In northeastern Spain, between the Ebro mouth and the Pyrenees, the outstanding airfields are at Saragossa, where there are several; in the neighborhood of Barcelona, where there are also several, including a seaplane station; and at Calatayud, Reus, and Barbastro.

In central Spain, Madrid is surrounded by aerodromes at Cuatro Vientos, Barajas, and Cetafe, the first two of which have runs of over 1400 yards. Somewhat further from the capital is the sizeable aerodrome at Alcalá de Henzres. Other aerodromes in central Spain

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are at Badajoz, Los Santos, Cabeza del *** and Salamanca.

In northwestern Spain the principal aerodromes are found at Burgos, Valladolid, Bilbao, León, Oviedo, Santiago de Compostella, and Vigo.

B. Portugal

Portugal's airfields are neither numerous nor well-equipped. The most important aerodrome and the only one with concrete runways is Portela de Sacaven, near Lisbon. At Ota is the best military aerodrome. It is the principal base of the small Portuguese Air Force. There are military air bases also at Sintra and Tances. Other aerodromes are at Alverea, Lisbon-Amadera, Lisbon-Montijo (under construction) and Oporto-Pedras Rubras (under construction). In addition, the landing field at Leiria has a good surface, though it provides no facilities.

The only Portuguese seaplane base of any consequence is Lisbon-Cabo Ruivo.

C. Conclusions

Most airfields in the Iberian Peninsula are inadequate in their present condition for modern air operations.

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*** Illegible.

## 8. LOCAL SUPPLIES

Severe food shortages in Spain indicate that German forces would have to bring with them the bulk of their own food. The present shortages are attributable partly to inefficient administration and inadequate distribution. Surpluses exist regionally for some food commodities, as indicated by Spain's present export to Germany of vegetables, olive oil, citrus fruits, and fish. An army passing through Spain could well acquire these supplies on the spot and could perhaps even get wheat, as the crop this year is said to have been good.

The mineral resources of the Iberian Peninsula would become available to Germany. Except for coal stocks along railways and coal reserves at mine heads, these would require exploitation.

Aside from the vegetable and mineral produce of the countries, few supplies of military value would be found.

## 9. POPULATION

In the event of a German invasion, the Spanish people will resist and harass the invading forces. Germany is now very unpopular among the Spanish masses, who dislike Naziism and believe that many of their deprivations are caused by German demands for food and other commodities needed in Spain. This anti-German feeling, combined with the traditional Spanish hostility to invaders and the strong national will to avoid the burden of additional warfare, make it certain that some sort of resistance will be offered to intruding German troops. The attitude that would be adopted by the Spanish Government, confronted by invasion, is not yet certain. General Franco, who has had close and friendly relations with Germany, is believed to wish Spain to remain neutral, although the official attitude of his regime has been pro-Axis. Since the removal of Serrano Suñer, the Government has moved away from partiality for the Axis toward a stricter neutrality, and the opinion is held in some informed quarters that if the Germans attempted to coerce Franco, he would call upon the United Nations to aid Spain in resisting. It is at least probable that elements among the Spanish ruling group would act against the Germans whether Franco did so or not. The effectiveness of Spanish resistance would of course depend largely on the speed and volume of United Nations reinforcements.

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The Portuguese people, softer and less war-hardened than the Spanish, are for the most part pro-United Nations. Due to the weakness of their country, and their own temperaments, it is unlikely that they would offer much resistance to the Germans, particularly if Spain had already collapsed before the invader. The Portuguese Government, it is anticipated, would remove itself to a Portuguese colonial possession if time allowed.

The populations of the two countries together amount to approximately 33 millions, or less than half the population of greater Germany. In manpower, as in industrial power, they present little obstacle to the Germans. It is obvious, however, that a German invasion which failed to be both rapid and complete would result in the creation of many new enemy divisions against Hitler, for the Spaniards, if supported by the United Nations and aroused to fury against Germany, would make a formidable addition to the anti-German coalition.

## SECTION B.

## Axis Capabilities For Movement Through France.

Note: Terrain and climate respecting France are considered in Section A.

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## 1. TERRAIN

See Section A, Part 1-A

## 2. CLIMATE AND WEATHER

See Section A, Part 2.

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## 3. HEALTH CONDITIONS

Health conditions in southern and southeastern France are only fair and can be expected to deteriorate in the event of important troop movements, the disruption of communications, and the further impairment of an already low food supply.

Public water supply and sewerage systems are satisfactory only in the larger towns. In Marseilles, however, epidemics of water-borne diseases are not infrequent.

Ticks are prevalent in the southern areas and transmit a tick-borne form of typhus fever. As a result of living and food conditions since the war small outbreaks of typhoid, typhus, diphtheria and dysentery have been reported and the incidence of tuberculosis has increased.

## 4. COMMUNICATIONS

### A. Railroads

The capacity of the railroad lines which supply the French Mediterranean is normally very high. However, railroad equipment is in poor condition and there are numerous vulnerable points whose destruction would seriously impede traffic.

There are three principal feeder routes:

(1) Narbonne-Sète-Montpellier-Nîmes, which is supplied by the following lines:

(a) Cerbere-Perpignan-Narbonne
(b) Bordeaux-Toulouse-Narbonne
(c) Limoges-Toulouse-Narbonne

These are all double track lines. The sections Toulouse-Narbonne-Sète and Montauban-Toulouse are electrified. The capacity of the Narbonne-Marseille line which is fed by these four routes can be estimated under normal conditions at 72 trains per day for a continuous period. The vulnerable points are indicated in the accompanying appendix.

(2) Vintimille-Marseille

The normal capacity of this double track, steam traction line from the Italian border can be estimated at 72 trains per day for a continuous period. The large number of tunnels and bridges make this line very vulnerable.

(3) Lyon-Marseille

From Lyon to the south there are double-

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track steam-operated lines on either side of the Rhone. This route is supplied by numerous lines from Paris, Switzerland and Alsace-Lorraine and is joined at Valence by the Mt. Cenis line from Italy. The line on the right bank goes to Nîmes (connection near Avignon to Marseille), Montpellier, Sète, and the Mediterranean coast west of Marseilles. The line on the left bank goes to Valence and Avignon where there is a bifurcation; both branches serve Marseilles, one via Arles and Miramas, the other by way of Cheval-Blanc and Miramas. The combined capacity of the two double-track lines from Lyon is about 144 trains per day. This capacity would probably be maintained as far as Marseille under normal conditions if there were no important traffic from the west which would have to employ the same tracks into Marseille. If the Rhone bridges were destroyed at Avignon and Tarascon the West bank line would be cut off from serving the Marseille and Southeastern area. The Miramas junction area is also a critical point in this network; at this point all lines from the north and the west must join or cross before continuing to Marseille.

(4) Clermont-Ferrand-Alès-Nîmes

This route, which is partly single-track, has an approximate daily capacity of 36 trains. At Nîmes the line branches to Montpellier, Avignon and Arles.

Total capacity of the principal lines (Routes

1, 3, and 4) from other parts of France to the Marseille area therefore approximates 252 trains daily. This number could be increased by the use of secondary lines. Sidings, workshops, and other facilities are available to accomodate this traffic. However, extensive operations in southern France would require the assemblage of quantities of locomotives and rolling stock greater than those at present available. There are serious shortages of fuel and lubricants which could be solved if, as can be assumed, the operations received priority in the allocation of the necessary material. However, the deterioration in the condition of equipment and materials could not be rapidly remedied and would certainly handicap train movements and prevent operations at capacity.

B. Roads

The entire French Mediterranean area is served by a network of good roads. These would be adequate for all military traffic which might be directed over them. The principal roads vary in width from 20 to 25 feet, have few steep gradients and are concrete-surfaced only in stretches. Further details are given in the accompanying appendix.

C. Waterways

The Rhone River, the Rhone-Sète Canal, the Arles to Marseille Canal and the Garonne and Midi canals are the principal waterways serving the French Mediterranean. They could be used for the transportation of bulk goods to supplement the railroads and roads. However the canals, particularly the Garonne and Midi, would be vulnerable to destruction of the locks.

D. Telecommunications

The French Mediterranean region is supplied by a complete telecommunications network which is adequate for all normal military needs.

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## APPENDIX

(1) Railroads

I. Narbonne-Nîmes - 146 km.

A. Main line.

1. Leads from southwestern France to Marseille area. Route by which traffic can reach line connecting all mediterranean ports.
2. Double track.
3. Standard gauge (1435 mm.). Electric traction Narbonne-Sète, 1500 V d.c. (overhead); steam, Sète-Nîmes.
4. Good roadbed; maximum axle load Narbonne-Béziers 20 metric tons, Béziers-Nîmes 18 metric tons; maximum gradient 5 per mille.
5. Vulnerable points: At Onglous suspension bridge over Hérault River. After Les Onglous for about 17 km. before Sète line follows narrow neck of land between sea and Etang de Thau. Between Sète and Frontignan line runs on embankment between lake and sea for about 4 km., crosses salt-water lake and canal.
6. Freight yards at Nîmes, Lunel, Montpellier, Sète, Béziers, Narbonne. Engine sheds at same places. Watering facilities at Nîmes, Lunel, Montpellier, Sète. Round houses, Nîmes (subsheds at Sète, Lunel).

B. Feeder lines.

a. Cerbère-Narbonne - 105 km.

1. Leads from Spanish border to all Mediterranean ports.
2. Double track.

3. Standard gauge. Steam traction.
4. Good roadbed; maximum axle load 18 metric tons; maximum gradient 15 per mille.
5. Vulnerable points: leaving Cerbere, tunnel 1 km. long; numerous cuttings between Banyuls sur Mer and Paulilles; near Palau del Vidre on iron-girder bridge over Tech River; runs close to lakes through swampy land on several embankments to Gruisseau-Tournebelle.
6. At Cerbere ample sidings fully equipped, but water must be brought in and stored in tank wagons. Freight yards at Narbonne and Cerbere. Engine sheds Cerbere, Perpignan, Narbonne.

b. Bordeaux-Toulouse-Narbonne - 407 km.

1. Leads from Atlantic coast to Mediterranean coast.
2. Double track throughout.
3. Standard gauge. Steam, Bordeaux-Montauban; electric, 1500 V d.c. (overhead), Montauban-Narbonne.
4. Good roadbed; maximum axle load Bordeaux-Marmande 18 metric tons, Marmande-Toulouse 16 metric tons, Toulouse-Narbonne 16 to 20 metric tons; maximum gradient Bordeaux-Toulouse 10 per mille, Toulouse-Narbonne 5 per mille.
5. Bridge over Tarn River 311.40 m. in length; embankment between Lamagistere and St. Nicolas; bridge over Drot River at Gironde; bridge over Garonne River at St. Macaire 211.70 m. long; bridge over Ciron River at Preignac; bridge over Aude River at Carcassonne 148.80 m. long.

6. Freight yards at Toulouse, Montauban, Bordeaux, Narbonne. Engine sheds at Toulouse, Castelnaudary, Carcassonne, Narbonne, Montauban, Agen, Marmande, Langon. Watering facilities at Toulouse, Montauban, Castelsarrasin, Bon-Encontre, Agen, Port-Ste.-Marie, Tonneins, Marmande, Langon, Beautiran, Villefranche, Castelnaudary, Bram, Carcassonne, Moux, Narbonne, Bordeaux.

c. Limoges-Brive-Toulouse-Narbonne. - 463 km. (last 150 km. from Toulouse to Narbonne described above).

1. Many lines lead into Limoges from north; can continue on this route to Mediterranean coast.
2. Double track throughout.
3. Standard gauge. Electric Limoges-Brive (1500 V d.c. overhead); steam Brive-Montauban; electric Montauban-Narbonne.
4. Good roadbed; maximum axle load Limoges-Brive 18 metric tons, Brive-Toulouse 16 metric tons, Toulouse-Narbonne 16 to 20 metric tons; maximum gradient Limoges-Toulouse 10 per mille, Toulouse-Narbonne 5 per mille.
5. Vulnerable points: Souillac viaduct over a valley followed by 2 curved viaducts; Marot tunnel at Degagnac 1.07 km. long; Tunnel de Roques over 1½ km. long; narrow gorge between Brive and Noailles; from Cazoule to La Chapelle de Mareuil for km. runs close to Dordogne River; bridge over Aude River at Carcassonne 148.80 m. long.
6. Freight yards at Limoges, Brive, Montauban, Toulouse, Narbonne, Engine sheds at Limoges, Brive, Cahors, Montauban, Toulouse, Castelnaudary, Carcassonne, Narbonne. Water facilities

at Limoges, Magnac-Vicq, Uzerche, Brive, Gignac, Souillac, Gourdon, Cahors, Lalbeuque, Caussade, Montauban, Toulouse, Villefranche, Castelnaudary, Bram, Carcassonne, Moux, Narbonne.

II. Vintimille-Marseille - 256 km.

1. Line leading from Marseille through Mediterranean ports to the east of Marseille to the Italian border.
2. Double track throughout.
3. Standard gauge. Steam. At Vintimille changes to electric traction on Italian system.
4. Good roadbed; maximum axle load 18 metric tons; maximum gradient 5-10 per mille.
5. Vulnerable points; "viaduct" over town of Monaco; whole line is full of bridges and tunnels, running close to coast except for a few short stretches; between La Ciotat and Marseille 3 long tunnels (500 m., 3 km., 1½ km. respectively).
6. Freight yards at Marseille, Aubagne, La Seyne-Tamaris sur Mer, Carnoules, Cannes-La Bocca, Nice.
   Engine sheds at Marseille, Aubagne, Toulon, Carnoules, Cannes-La Bocca, Nice-St. Roch, Vintimille.
   Watering facilities at Marseille, Aubagne, La Ciotat, La Seyne-Tamaris sur Mer, Toulon, La Pauline-Hyeres, Carnoules, Les Arcs, Cannes-La Bocca, Cannes, Nice, Vintimille.
   Roundhouses at Marseille, Carnoules, Nice. (sub-shed at Toulon).

III. Lyon-Marseille - about 350 km. by main route.

1. This is the main route to the Mediterranean coast. It can be reached from practically all points in the north and north east, by many different routes. A line from Italy via Mont Cenis also feeds in.

There are two routes (with several alternative stretches) one on each bank of the Rhône, with connecting bridges at Peyraud, St. Rambert d'Albon, Livron, Avignon, Tarascon, Arles. All routes must pass through Miramas and take one of two routes on to Marseille.

2. Both routes are double track throughout (as are alternates also). The line on the east bank is the more important and runs on multiple tracks from Lyon to Chasse sur Rhône.
3. Standard gauge throughout. Steam traction.
4. Good roadbed; maximum axle load on west bank 16 metric tons, on east bank 18 metric tons; maximum gradients 5-10 per mille.
5. Vulnerable points: the 6 Rhône bridges listed above are essential to communication between the east and west banks; the bridges over the Saône and Rhône Rivers at Lyon are important for access to the city and to the lines from Lyon on to the Mediterranean. Vulnerable points on the west bank are: many tunnels and bridges, including 8 tunnels 500 m. or more long; bridge over the Ardèche River at St. Just-St. Marcel 291 m. long; bridge over Cèze River at Bagnols 116m. long. On the east bank there are many bridges over tributaries to the Rhône River, tunnels each 600 m. long at Serves-sur-Rhône - Erome and Valence; line follows river closely from Lyon to Pierrelatte. From Miramas to Marseille the line via Rognac is the main line; it passes between cliffs and the Etang de Berre, running through a tunnel 5 km. long just before entering l'Estaque. From Miramas to Marseille via Port de Bouc the line passes over many canal bridges, crosses a viaduct 943 m. long over the Etang de

Caronte, runs along the Estaque peninsula with a series of tunnels and land-slide galleries, crosses Eaux Salées viaduct 79.4 m. long, Méjean viaduct 80 m. long, and viaduct over Loubatons ravine 105 m. long.

6. On the west side there are:

Freight yards at Lyon, La Voulte sur Rhône, Le Teil, Nîmes; Engine sheds at Lyon, Givors, La Voulte sur Rhône, Le Teil, Nîmes; watering facilities at Lyon, Givors, Peyraud, La Voulte sur Rhône, Le Pouzin, Le Teil, L'Ardoise, Pont d'Avignon, Remoulins, Nîmes.

On the east side there are:

Freight yards at Lyon-Brotteaux, Lyon-Venissieux, Lyon-Guillotière, Chasse sur Rhône, Portes, Orange, Avignon, Tarascon, Arles, Miramas, Rognac, Marseille; engine sheds at Lyon-Vaise, Lyon-St. Paul, Lyon-Perrache, Lyon-Mouche, Lyon-Croix Rousse, Lyon-Brotteaux, Lyon-Venissieux, Chasse sur Rhône, Portes, Livron, Pierrelatte, Orange, Avignon, Tarascon, Arles, Miramas, Rognac, Marseille-St. Charles, Marseille-Blancarde; watering facilities at Lyon-Vaise, Lyon-St. Paul, Lyon-Mouche, Lyon-Croix Rousse, Lyon-Perrache, Lyon-Brotteaux, Lyon-Venissieux, Chasse sur Rhône, St. Rambert d'Albon, Valence, Portes, Livron, Pierrelatte, Orange, Avignon, Barbentane, Tarascon, Arles, Miramas, Rognac, Pas des Lanciers, Port de Bouc, l'Estaque, Marseille-St. Charles, Marseille-Blancarde.

There are round houses at:

| Place | No. locomotives |
|---|---|
| Venissieux (Lyon) | 100-150 including subsheds at St. André |
| Lyon-Mouche | 144 including subsheds at Perrache, Croix Rousse |
| Lyon-Vaise | 88 including subsheds at Brotteaux, St. Paul |
| Badan (Givors) | 120 |
| Portes | 77 including subsheds at Livron |
| Le Teil | 153 " " " La Voulte |
| Avignon | 256 " " " Pierrelatte |
| Nîmes | 232 " " " Tarascon, Arles and two on line to Sète |
| Miramas | 96 |
| Marseille | 142 including subshed at Aix |
| Marseille-Blancarde | 135 |

Locomotive repair shops at Arles and Oullins. These with another at Nevers can handle all repairs on locomotives of the Southeastern Region of the SNCF (i.e. 5738 standard gauge locomotives, plus a few narrow gauge and a few rail cars).

Rolling stock workshops at Oullins, Lyon-Mouche, Lyon-Perrache, Marseille-Prado, and a shop for component parts at Arles.

IV. Clermont-Ferrand - Alès - Nîmes. 304 km.

1. A secondary line traversing central France. Clermont-Ferrand, the starting point, is easily reached from the north and northeast by several routes.

2. Double track Clermont-Ferrand to Arvant 60 km.
Single track Arvant to Beaumont-Lauriat 7 km.
Double track Beaumont-Lauriat to Brioude 3 km.
Single track Brioude to Alès 185 km.
Double track Alès to Nîmes 49 km.

3. Standard gauge. Steam traction.
4. Good roadbed; maximum axle load 18 metric tons; gradients 10 to 25 per mille.
5. Vulnerable points: for about 30 km. beginning at Vic le Comte line follows bank of Allier River through mountainous country with sharp curves (this is a double-track section); Brioude to Alès single track with many short tunnels through river valley.
6. Freight yards at Clermont-Ferrand, Alès, Nîmes. Engine sheds at Clermont-Ferrand, Brioude, Langeac, Langogne, Alès, Nîmes. Watering facilities at Clermont-Ferrand, Arvant, Beaumont-Lauriat, Brioude, St. Georges d'Aurac, Langeac, Langogne, Alès, Mas-des-Gardies, Nozières-Brignon, Nîmes.

   Roundhouses:

| | |
|---|---|
| Clermont-Ferrand | 143 locomotives including subsheds at Vichy, Gannat, St. Germain des Fosses |
| Langeac | 98 |
| Alès | 144 locomotives including subshed at Langogne. |

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# APPENDIX

## (2) Roads

The following roads would be the principal ones employed by the Germans in the event of major military operations in the French Mediterranean area.

West to East:

(a) The coastal route from Perpignan to Montpellier, to Toulon, and to Nice, which includes National Routes Nos. 9, 87, Secondary Routes Nos. 572, 538, 559, and National Routes Nos. 8 and 7.

(b) The road from Biarritz to Pau, to Toulouse which includes National Routes 117, 125, and 20.

(c) The route from Bordeaux to Toulouse and Narbonne which includes National Routes Nos. 10, 127, and 113.

North to South:

(a) The route from Clermont-Ferrand to Le Puy, Nîmes, and the Mediterranean which includes National Routes Nos. 89, 106.

(b) The route from Lyon to Saint-Etienne, to Le Puy, to Nîmes and the Mediterranean. This includes National Routes Nos. 88, 106.

(c) The route from Lyon to Montpellier by way of Nîmes. This includes National Routes Nos. 86, 87.

(d) The route from Lyon to Valence, to Avignon, and Marseille which includes National Routes Nos. 7, 8, or Secondary Route No. 538.

(e) The route from Lyon to Grenoble, to Marseille which includes National Routes Nos. 6, 85, 96, 8.

Roads from West to East:

(a) Perpignan--Montpellier--Toulon--Nice

The importance of this road cannot be overestimated, as it is the main coastal artery along southern France's Mediterranean border. It serves as the main connecting link for the important coastal cities, but it is, at the same time, open to attack from the sea in many places by both planes and surface vessels.

From Perpignan to Narbonne the road is of two width dimensions, varying between the 15 to 20 foot ratio and that of about 23 feet, at the same time being subject to gradation of from 4 to 7 per cent. The remainder of the section to Montpellier is a good macadam road, without curves and without inclines, crossed from time to time by railroad intersections. The section from Montpellier to Arles is about 23 feet wide, somewhat more circuitous, but a generally good road.

From Arles to Salon the road is good macadam without impedimenta, and from Salon to St. Cannat there is a secondary road from 15 to 20 feet wide, and this in turn joins a straight macadam road to Aix which is around 22 feet in width. From Aix to Toulon the road is good macadam but is very circuitous with ascents and descents of from 4 to 7 per cent. From Toulon to Cannes the road is macadam, slightly circuitous, but only from 15 to 20 feet in width, at the same time running very close to the coast line. From Cannes to Nice the road keeps the same width but the pavement is largely of cement.

Conclusion: Although not permitting large troop movements, this road is nevertheless capable of bearing heavy traffic and offers possibilities for considerable speed, not being hindered by frequent gradation and many built-up areas.

(b) Biarritz--Pau--Toulouse

This is an important road for the movement of troops between the Biscayan and Mediterranean areas. From Biarritz to Pau the route is characterized by many ascents and descents ranging from 4 to 7 per cent, thus forming a generally rolling terrain. It is macadam pavement, and about 23 feet wide. The road, which is paralleled by a railroad line and has frequent intersections with it, follows the course of the stream called the "Gare de Pau" very closely. From Pau to Tarbes, however, the road is almost perfectly straight with a few ascents and descents of from 4 to 7 per cent. From Tarbes to Toulouse there is nothing particularly distinctive about the route except for the fact that it is accompanied by a railroad line which frequently intersects between Robasten de Bizzore to Toulouse.

Conclusion: The road can be said to offer satisfactory passage for military purposes, for, although hilly and rolling, it is not, nevertheless, difficult terrain.

(c) Bordeaux--Toulouse--Narbonne

From Bordeaux to Toulouse this road follows the course of the Garonne River very closely, crosses the river twice and passes through one large town or built-up area after another. Although the road is good macadam

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movements, this road is nevertheless capable of bearing heavy traffic and offers possibilities for considerable speed, not being hindered by frequent gradation and many built-up areas.

(b) Biarritz--Pau--Toulouse

This is an important road for the movement of troops between the Biscayan and Mediterranean areas. From Biarritz to Pau the route is characterized by many ascents and descents ranging from 4 to 7 per cent, thus forming a generally rolling terrain. It is macadam pavement, and about 23 feet wide. The road, which is paralleled by a railroad line and has frequent intersections with it, follows the course of the stream called the "Gare de Pau" very closely. From Pau to Tarbes, however, the road is almost perfectly straight with a few ascents and descents of from 4 to 7 per cent. From Tarbes to Toulouse there is nothing particularly distinctive about the route except for the fact that it is accompanied by a railroad line which frequently intersects between Robasten de Bizzore to Toulouse.

Conclusion: The road can be said to offer satisfactory passage for military purposes, for, although hilly and rolling, it is not, nevertheless, difficult terrain.

(c) Bordeaux--Toulouse--Narbonne

From Bordeaux to Toulouse this road follows the course of the Garonne River very closely, crosses the river twice and passes through one large town or built-up area after another. Although the road is good macadam pavement, and capable of bearing the weight of heavy trucks and other equipment, it nevertheless has many curves, and a great many intersections in the first two-thirds of the way from Bordeaux. As the road approaches the coastal region of Narbonne the intersections become fewer and there are fewer built-up areas.

Conclusion: An important inter-coastal connection which might well serve to connect the port of Bordeaux, and the whole western part of France, with the areas of military concentration on the Mediterranean shore line. Although the road is not free from impediments such as curves, bridges, etc., it nevertheless has a good surface and satisfactory width.

Roads from North to South:

(A) Clermont-Ferrand--Le Puy--Nimes

This is one of a group of roads descending from north-eastern France which must assuredly be used for troops in passage from the garrisons in northern France and from Germany. This particular road from Clermont-Ferrand to Le Puy and Nimes is very circuitous with frequent ascents and descents, and it passes through numerous built-up areas. From Le Puy, however, southward to Nimes the road passes through the Cevennes mountain range and is very circuitous. Nevertheless, the pavement is macadam, the width about 23 feet, and undoubtedly capable of bearing heavy machines.

Conclusion: The road is important because of its central location, lying as it does in the heart of France, and is in direct line from the Paris region and the vicinity of Vichy. Nevertheless, it is not an altogether satisfactory route because of its impediments such as mountains and curves.

### (b) Lyon--St.Etienne--Le Puy

Another of the central arteries from northern France to the south, the road leading out of Lyon, which connects with St. Etienne by way of Givors and St. Chamond, is paved with cement for a part of the distance and for the remainder is macadam paved. This sector is somewhat winding, however, and is broken up by numerous towns and built-up areas as well as by railroad crossings at many intervals. From St. Etienne to Le Puy the road is very circuitous, passing alternately through both wooded and open areas with numerous ascents and descents. From Le Puy to Nîmes, however, the road passes through the Cevennes mountain area and is extremely circuitous, making the passage of large convoys seemingly difficult. At the same time this section of the road is paralleled by a railway line which intersects frequently but which branches off before Nîmes. From Nîmes, there are good road connections with Montpellier, situated near the coast, and with Arles, situated near the mouth of the Rhône.

Conclusion: The northern sectors of this route have definite limitations with their broken areas and congested sections as well as the mountainous areas south of Le Puy. It, nevertheless, connects with Montpellier which is in a central position for the distribution of men and material in both a westerly and easterly direction.

### (c) Lyon--Nîmes--Montpellier

Another of the central routes, from Lyons to Givors the road is partially paved with cement, and presumably is about 23 feet wide. However, though the road from Givors southward towards Serrières is macadam paved, it is nevertheless filled with many ruts and is only

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(b) Lyon--St.Etienne--Le Puy

Another of the central arteries from northern France to the south, the road leading out of Lyon, which connects with St. Etienne by way of Givors and St. Chamond, is paved with cement for a part of the distance and for the remainder is macadam paved. This sector is somewhat winding, however, and is broken up by numerous towns and built-up areas as well as by railroad crossings at many intervals. From St. Etienne to Le Puy the road is very circuitous, passing alternately through both wooded and open areas with numerous ascents and descents. From Le Puy to Nîmes, however, the road passes through the Cevennes mountain area and is extremely circuitous, making the passage of large convoys seemingly difficult. At the same time this section of the road is paralleled by a railway line which intersects frequently but which branches off before Nîmes. From Nîmes, there are good road connections with Montpellier, situated near the coast, and with Arles, situated near the mouth of the Rhône.

Conclusion: The northern sectors of this route have definite limitations with their broken areas and congested sections as well as the mountainous areas south of Le Puy. It, nevertheless, connects with Montpellier which is in a central position for the distribution of men and material in both a westerly and easterly direction.

(c) Lyon--Nîmes--Montpellier

Another of the central routes, from Lyons to Givors the road is partially paved with cement, and presumably is about 23 feet wide. However, though the road from Givors southward towards Serrières is macadam paved, it is nevertheless filled with many ruts and is only from fifteen to twenty feet wide over a distance of about eighteen miles. From Serrières to Le Pouzin the road is good macadam with a width of about 22 feet, but again from Le Pouzin southward for a distance of about 4 miles the road is from 15 to 20 feet wide with broken-up sections. The remainder of the distance to Pont-St.-Esprit--about 26 miles in length--varies both in the width and condition of the road. From Lyon to Pont-St.-Esprit the road closely follows the right bank of the Rhône with frequent intersections with the railroad which runs on a parallel line. For the next fourteen miles after Saint-Esprit, where the road leaves the Rhône in a southwesterly direction, the route is macadam paved and around 22 feet in width. Over the next sector, however,--around 9 miles in length--the road is very circuitous and only about 15 to 20 feet wide. The remainder of the distance to Nîmes is good macadam pavement, and around 22 feet in width.

Conclusion: This is a difficult road, and, although its usefulness cannot be disputed because of its central location, it is nevertheless surrounded by other routes running somewhat parallel but with fewer impediments.

### (d) Lyon--Valence--Avignon--Marseille

From Lyon to Valence the road follows the course of the Rhône River at varying distances, but in a relatively straight line. It is interspersed with gradations at frequent points of from 4 to 7 per cent, but at the same time it passes through largely open country until the Valence region where it is more built-up. From Valence to Avignon the road is very straight, and lies, for the most part, in very open country. From time to time there is an intersection with the railway line which follows the same course as the road at varying distances. A short distance after Avignon the road crosses the Durance river and continues to Sensar where it becomes a secondary road, presumably with gravel pavement and from 15 to 20 feet wide over a stretch of about 7 miles. From Salon to Marseille the road is macadam paved, fairly circuitous, but only 15 to 20 feet wide. Salon itself lies in open, flat country, and the road from that city to Marseille lies in the same sort of territory.

Conclusion: This is a generally good road, and one which offers a great opportunity for quickly expediting both troops and supplies. Although it has certain impediments in the lower region, it is nevertheless one of the most direct routes from north to south.

(e) Lyon--Grenoble--Marseille

From Lyon to Grenoble the route is comparatively straight; there is one rutted section of about 3 miles in length at a point which is 16 miles before Grenoble. The Grenoble area is a wooded and mountainous one, with elevations as high as 3,000 feet at several points. The route southward from Grenoble to Aix is both circuitous and mountainous, but it is good macadam pavement with few ruts and other obstacles. To all appearances, it is only 15 to 20 feet wide, however, and at Sisteron it crosses the Durance River and follows closely on the right bank until a point 5 miles above Peyrolles. After crossing the river at this point its width stretches to 22 feet and as such it remains, passing through Aix to Marseille. From Sisteron on south to Aix there is a gradual descent from the mountainous areas to the coastal regions.

Conclusion: For light-weight vehicles and small groups this road might well be used as an alternative to the more congested routes. However, due to its narrow character and its many inclines and the congestion caused by winter snows, it does not appear reasonable to assume that it would be frequently employed for the purposes of military passage.

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## 5. VITAL AREAS

Effective military operations based on the French Mediterranean require control of the port and industrial areas in the neighborhood of Marseille and Toulon and the communications route (road, railroad, waterway, and telecommunications) of the Rhône valley. The railroad junctions at Avignon and Miramas are of particular importance. The bauxite deposits, aluminum industry, and hydro-electric developments of Southern France are all of great importance to the occupying forces.

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## 6. PORTS AND NAVAL BASES

The French Mediterranean coast is supplied with port facilities capable of handling all traffic which could be directed to them. The only port with first class commercial facilities is Marseille which normally handles a daily shipping traffic of over 40,000 tons. It is equipped with extensive docking, loading and communications facilities, has seven dry docks and floating cranes with lifting capacity up to 150 tons. Toulon is equipped as a first-class naval base and in normal times is used by commercial vessels of only small size. The other Mediterranean ports and anchorages are of minor importance and, with the exception of Nice and Sète, have no loading appliances.

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## APPENDIX

### Ports and Naval Bases
(listed from west to east)

**Port Vendres:**

On railroad line from Cerbère to Narbonne.

Small harbor with good shelter.

Avant-Port: Accommodates vessels up to 475' long; quayage 590', depth alongside 26 feet.

Port-Neuf: Length 984', mean width 459'. Depth 29'; alongside, 25 to 26 feet.

Port-Vieux: Length 656', mean width 328'. Depths 13 to 20 feet.

Quayage 1,864 feet.

No lifting appliances.

**Sète:**

On railroad line from Nîmes to Narbonne.

Excellent harbor for destroyers and submarines.

Total quayage for embarking or disembarking 4,297 feet; depth alongside 23 feet.

Four small floating cranes; one 15-ton crane; one 35-ton floating sheer-legs.

No dry or floating docks.

Storage in more than 10 tanks for 82,935 tons oil and gasoline.

**St. Louis du Rhône:**

Area, 32 acres.

Depth 19'8"

Length of quayage 4,981 feet; depth alongside 14 feet 9 inches.

8 small travelling cranes.

**Port de Bouc:**

On railroad line from Miramas to Marseille.

Access impossible in high seas because of current.

Area, 73¼ acres.

Depth in central harbor 29 feet, at entrance from sea 31 feet.

267 yards of quays, plus a small quay for oil tankers.

Small repair dock (important, but without a dry dock).

**Martigues:**

On railroad line from Miramas to Marseille via Port de Bouc.

Depth of channel 29½ feet.

One quay 820 feet long.

Oil storage capacity at refinery 250,000 tons.

**Etang de Berre:**

On Marseille-Miramas railroad line.

Area, 37,000 acres, of which 15,000 with depth of 26 to 32 feet.

Proposed length of quays, 43,000 yards.

No lifting gear.

Oil refinery with storage capacity of 210,000 tons.

**Marseille:**

Normally lands 6 to 8 million tons of goods a year.

Railroad connects to Paris and north via Lyon; on line along Mediterranean coast.

Area, 750-900 acres.

Depth 13 to 19 3/4 feet in inner ports, up to 98 feet in avant-ports.

Length of quayage 70,900 feet.

One 150-ton floating crane with lifting and slewing jib; one 50-ton, one 25-ton, two 20-ton, and over 20 smaller floating cranes; large numbers of fixed and traveling cranes.

Seven dry docks, from 295 to 698 feet long and 52 to 82 feet broad, with depth at sill varying from 19 feet 2 inches to 29 feet 5 inches. Four new ones are projected, the longest to be 1,230 feet (November, 1940).

Large coal bunker capacity.

Capacity for 36,000 tons Diesel oil and gasoline; two petroleum refineries with storage capacity for 75,000 tons; storage for 1,970 tons of fuel oil.

**La Ciotat:**

On railroad line from Marseille to Vintimille.

Small harbor and small shipbuilding and repair yard; area, 19 3/4 acres. Depth 9 feet 10 inches to 18 feet. Five berths 328 to 490 feet long.

Length of quayage 2,390 feet.

One 80-ton floating sheer-legs.

Four shipbuilding cranes in building slips.

Dry dock 508 feet long (useful length 461 feet); width 65½ feet; depth at sill 21 feet 3 inches.

**La Seyne:**

On railroad line from Marseille to Vintimille.

Area, 6 acres.

Depth 9 feet, 10 inches to 16 feet, 5 inches.

Length of quayage 1,739 feet; depth alongside 13 feet 1 inch to 16 feet 5 inches.

No lifting facilities.

**Toulon:**

On railroad line from Marseille to Vintimille.

Main French naval base.

Area sufficient to accommodate 8 capital ships and attendant craft.

Depth in roadstead 6 to 7 fathoms.

Length of quayage in commercial harbor 3,936 feet; depth alongside 9 feet 10 inches to 26 feet.

8 floating cranes; numerous cranes on quays.

Naval dockyard:

Building slips--4 for destroyers, 5 for submarines.

Dry docks--11. Lengths from 294 to 1,385 feet.

3 floating docks for destroyers 164 feet long.

1 submarine lifting dock 322 feet long.

Bormes Roads:

On railroad line from Marseille to Vintimille.

So shallow capital ships must anchor at least 1 mile from port.

Small quay; depth alongside 9 feet.

No lifting appliances.

Small boat slip.

St. Tropez:

On railroad line from Marseille to Vintimille.

Anchorage off Pinede Point for destroyers and larger submarines; smaller submarines berth inside harbor.

Quayage--north mole, 125 yards available for landing craft; southwest and west mole, 60 yards quayage, depth alongside 12 feet, served by single-track railway on quay.

No lifting appliances.

St. Raphael:

On railroad line from Marseille to Vintimille.

Area, 5 acres.

Length 492 feet; width, maximum, 525 feet, minimum 246 feet; width of entrance 230 feet.

Depth 16 feet 5 inches.

Length of quayage 590 feet, with a depth of 6 feet 6 inches for 65 feet and a depth of 16 feet 5 inches to 23 feet 3 inches over the rest of the length; jetty is 4 feet above sea level.

## Cannes:

On railroad line from Vintimille to Marseille.

Area, 29½ acres.

Depth 18 feet to 23 feet (has been dredged to about 3' more than charted depth).

Largest ship that can enter is a destroyer - 3 or 4 could berth.

Slips for small vessels.

Length of quayage 3,330 feet.

One small crane.

## Nice:

On railroad line from Vintimille to Marseille.

Area, 25 acres.

Depth 21 feet to 23 feet.

Maximum length admitted to basins - Bassin du Commerce 410 feet, others 295 feet.

Quayage 4,950 feet long; depth alongside 19½ to 23 feet.

11 small cranes, one 30-ton crane.

2 patent slips 288 and 162 feet long; maximum depths over blocks 16 feet and 24 feet respectively.

## Villefranche:

On railroad line from Marseille to Vintimille.

Space for 2 capital ships and a few small cruisers; a disused torpedo boat base.

Quayage 1,000 yards long but shallow.

One small crane.

Dry dock 180 feet long, but with shallow approach.

## Menton:

On railroad line from Marseille to Vintimille.

Area, 14-3/4 acres.

Depth 19 feet.

Anchorage good - harbor exposed to easterly winds. Length of quayage 1,083 feet; depth alongside - East quay 20 feet, West quay 6 feet.

## 7. AIR BASES

The airport facilities of southeastern France would require considerable improvement and extension before serving major military operations. The number of existing fields is not large and very few fields are equipped to accomodate heavy or even medium bombers. Existing installations are largely confined to the Mediterranean rim and the Rhone valley and any increase in the number of airports would be limited by the topographic characteristics of the hinterland. The most important airports are at Marseille (Marignane), Salon en Provence, Montpellier, Toulouse, Carcassonne, Perpignan, Larzac, Nîmes, Istre, and Aix. There are important seaplane installations at Perpignan, Berre, Toulon and St. Raphael (Fréjus).

## 8. LOCAL SUPPLIES

The French Mediterranean region has no important economic resources except its vineyards, fruits, and vegetables, bauxite deposits, and some coal. In the Marseille area there are important oil refineries, engineering and chemical establishments. The town and docks of Marseille are equipped with extensive warehouse and cold storage facilities. There is little timber, cement or petroleum, but there are coal mines. The region is heavily dependent upon other parts of France for the importation of cereals and other foodstuffs. The departments east and west of Marseille have, under wartime conditions, suffered greater food shortages than almost any other areas in France. This situation has been aggravated by a drought and bad harvest this year.

## 9. POPULATION

Axis military movements based on the French Mediterranean would operate for the most part along the populated zones of the Rhone valley and the Mediterranean ports and the towns of the hinterland. These regions, whose populations have often demonstrated their anti-Axis sentiments are believed to harbor hidden supplies of small arms and ammunitions as well as a number of underground organizations. The opportunities for sabotage would certainly increase in the event of important military movements in the region. The opposition which the population could be expected to offer to the Axis would probably equal or even exceed that experienced in the Occupied Zone of Northern France.

## SECTION C.

### Axis Capabilities
### For Movement through Italy.

## 1. TERRAIN

### A. Terrain in Sicily

Sicily is in the key position to supply airplane coverage for ship movements to and from Tunisia and can be used easily as a stepping stone between the Italian mainland and the African coast. In general, the island is triangular, with the apex to the southeast, in which rugged mountains are found along the east half of the north side (including the 10,700-foot cone of Mt. Etna), in the southeastern corner and the western central portion. Plains are in the center of the east coast, on the west side of the southeast corner and at the western end of the island. The remainder is hilly upland in which elevations vary from 4000 feet in the north to 1300 feet in the south. The average relief is 400 feet per mile.

From Messina, three miles across the Strait of Messina from Italy, movement is possible along the eastern side of the island via either railroad or road to the southeastern corner of the island or the southern coast. This is about 140 miles. South of Messina the two lines skirt the sharply defined base of the Peloritani Mountains and Mt. Etna, cross the mouth of the flat Catania plain, and then follow the narrow coastal plain at the base of the Iblei Mountains to Pozzallo at the southeastern corner of the island. The railroad tunnels along the base of the Peloritani and Iblei Mountains make this line subject to sudden dismemberment by bombing. The road is also subject to the same action, particularly where it crosses the Catania plain.

Three north-south railroad passages can also be affected across the island in the western half. The passes are at 4,000, 2,500 and 1,200 feet on the lines from east to west respectively. All three have numerous tunnels.

In addition, a railroad and a road encircle the island. Generally, they are near the coast at low elevations except in the northwest corner of the island, where they cross the hilly upland at about 1200 feet above sea level.

East-west railroad transportation is available through the main line running west from Catania and the minor line from Syracuse to the central portion of the island where they meet the north-south lines. For the most part these lines run through hilly upland or low mountains in which there are relatively few people.

In addition to the road along the east coast there are four main roads across the island. Each goes through the hilly upland, which comprises most of Sicily. The eastern roads cross passes at 1500 feet in the south and over 4000 feet in the north. In the rugged mountains, on the north, they are vulnerable to quick destruction by bombing. The road from Agrigento through the center of the island to Palermo has a lower pass, about 2600 feet, but traverses country as rough as that to the east. Farther west the passes are lower and the distance across the island shorter.

East-west movement by road is the same as that by railroad on Sicily. The main roads lead out of Syracuse and Catania and cross the low Iblei Mountains or the flat Catania plain and a part of the hilly upland to meet the north-south roads in the center of the island.

## B. Terrain in Corsica and Sardinia

These two islands might furnish airplane coverage for boat movements south from the several ports surrounding the Ligurian Sea; and the location of Sardinia opposite Tunisia, plus Sardinia's airfields make that island an area to be held by land forces. But mountainous Corsica, deficient as to both highways and railroads in its southern half, can ill serve as a stepping stone and would seem to have little strategic value in itself as long as both Sardinia and Corsica are held by the Axis.

In Sardinia, landings can be made on the northeast and northwest corners of the island from French Marseilles and Nice, and from Italian Genoa, Spezia, Leghorn and Civitavecchia, the nearest continental port. Interior railroads and highways tie these northern ports to the great southern plain back of Cagliari. Most of the island is mountainous and wild, and the north-south route climbs to an altitude of 1300 feet, with tunnels near the upper levels whose destruction would cut off north-south rail communication.

Olbia (Terranova), the northeastern port has an airfield nearest to those of Rome.

Population is scant because of the mountainous terrain. Aside from lowland farmers there is a mining population in the extreme southern part of the island, associated with valuable war minerals.

## C. Terrain in Italy

Italy is a peninsula because of its mountain range, but its coastal lowlands, however narrow, afford east side and west side routes for rails and highways from the base of the peninsula to its tip. Moreover, where the Apennines run east and west across the base of the peninsula, the mountains are at much their narrowest. At this weakest point in the mountains, passes are not only short, but are relatively low, so that in the neighborhood of Florence, for example, three north-south rail lines traverse the mountains within a distance of 25 miles.

While it persists as such, the political barrier of Switzerland is more potent than the Alps in barring troop movements from Germany into Italy. In the meantime the French Alps to the west of Switzerland are crossed by a main year-round rail route entering the Po plain at Turin, while another main line from France avoids the Alps by hugging the Mediterranean shore. This line persists along the west coast of Italy clear to the tip of the peninsula.

East of Switzerland the Alps barrier is crossed by three main rail routes debouching onto the Po plain. The most direct runs south from Munich to Verona by way of the Brenner Pass, lowest route through the Alps. Two others crossing the Julian Alps lead (1) from Salzburg via Villach to the plain at Udine and (2) from either Salzburg or Vienna onto the plain at Gorisia. To the east of the Alps proper, the lowest pass of all leading into north Italy, (the Pear Tree Pass) carries the main rail line from Budapest to Trieste on the Adriatic Sea.

As in the Florence district, the Apennines furnish low short passes back of Genoa - the easiest crossing of these mountains anywhere. Altogether 8 passes across the northern east-west range of the Apennines permit main rail lines (seven of them electrified, and some double tracked) to shift traffic from the great catchment basin of the Po plain over to the important west coast lowland. From Pisa and Florence south, connection with the Tiber valley, paralleling the coast, relieves the strain on the west coast rail line, both of these routes to Rome being double tracked and electrified.

Winter snows in the Apennine heights are not sufficient to impede rail traffic, but numerous highways crossing the mountains are subject to ice and sleet which slow up motor traffic.

A relatively long pass with resultant easy gradients trends southward from Ancona (an east coast port) to Rome, but other rail lines crossing the lower peninsula are far less favorable to southward movement from the east coast. Ancona has good port facilities, with rail lines extending onto the inner mole alongside the wharfage.

The eastern coastal lowland furnishes an almost level route all the way to the tip of the "heel", with two cut off rail lines crossing a very low, gentle divide between Bari, an important east coast port, and Taranto, the great southern naval base. In this latter port, transfer of troops from train to boat would be far more effective than transfer of material. The coastal lowland permits a rail line to follow the shore of the "instep" and "toe" of the peninsula, but the route is fairly tortuous due to the promontories and curving bays which alternate almost constantly, and the coastal rail line from Naples south along the west coast is of similar nature but with many more headlands that require tunneling. Both of these lines, leading to the ferry to Sicily, could be put out of commission by small commando raids, since the tunnel entrances are just above the water line and therefore easily open to dynamiting.

The all important coastal railroads are vulnerable wherever they cross a stream reaching the sea, since these streams are bridged at their very mouths.

The passes and coastal lowlands (except along the "sole of the boot") that locate railroads invariably locate paralleling highways, older far than rail lines. Moreover, down the whole length of the peninsula there are numerous mountain passes crossed by highways where no railroad exists. Such a route (the Via Flaminia), running due south to Rome from the northeast coast, leaves the coast just south of Pesaro and belongs in the first rating of Italian highways. Another good but more typically mountainous route leads directly across the Apennines from Manfredonia, under the east coast "spur" to Salerno on the west coast south of Naples. Roads below this one, crossing the peninsula, are neither direct nor first class; and unless they have been finished since the war began, do not exist along the "instep" or eastern under side of the "toe".

Even the west coast road, from Passtum south, is second rather than first class, because peace time needs have called for nothing better.

To send troops or material down the Adriatic by boat from Trieste to the ports of Bari and Brindisi would not put them in communication with Sicily (or the "toe") by road, good roads leading from those ports only as far as Taranto, under the "heel". It would seem that Naples and Salerno would be the jumping-off place for Sicily bound traffic dependent on southern Italian highways.

## D. Terrain in Tunisia And Tripolitania

This discussion assumes that Tunisia and Tripolitania are occupied by the Axis and are being used as a base for an attack on Algeria.

The supply bases for an advance into Algeria are the ports of Bizerte, Tunis, Sousse, Sfax, and Gabes in Tunisia, and Tripoli in Tripolitania. Bizerte and Tunis can be reached by ship from Sicily overnight, while the voyage to Tripoli would require one day's sailing time.

Communications between these ports and Algeria are greatly influenced by the terrain of Tunisia and Tripolitania. There are four major physiographic regions with which to contend. (1) The northern half of Tunisia, the so-called Tell, is mountainous, with elevations reaching 3000 feet, and even 4500 feet in many places. This region is featured by rugged topography with a large number of discontinuous chains trending generally from northeast to southwest. Portions of this region are the least accessible in Tunisia. (2) The steppe country adjoins the mountains to the south and extends to the line of Shotts - the Shott el Rharsa, the Shott Djerid, and the Shott el Fedjadj. The High Steppes in the west are characterized by discontinuous chains separated by broad plains. The High Steppes merge into the Low Steppes to the east at about the 500 foot contour. Hills are few and there is little obstacle to movement. Near the coast the drainage is imperfect, forming a line of inland lagoons from Gabès to Sousse. (3) Below the Shotts, desert conditions prevail. This region is marked by a fairly well dissected and rocky plateau, by the semicircular Djebel escarpment approximately paralleling the coast, and by the low-lying coastal fringe south from Gabès. (4) From the vicinity of Bizerte and Tunis a slightly undulating coastal plain extends south beyond Tripoli, forming a narrow corridor at the Cap Bon peninsula and south of Gabès.

The lines of communication through the Toll country, in northern Tunisia, into Algeria are clearly defined, being aligned in a general northeast-southwest direction along the valleys and narrow coastal plain. In a few places the area is sufficiently broken to permit lateral lines of communication between the principal routes. They would facilitate the shifting of military strength by the enemy. There are three routes of advance in this area. (1) Between Bizerte and Bône a coastal road traverses the northern edge of the mountains; (2) A route extends from Tunis along the gently sloping Medjerda valley to Ghavdimaon near the Algerian frontier; and (3) Another route between Tunis and Souk Ahras, though less easily traversed because some hilly land must be traversed, goes via Medjez-el-Bab and Le Kef. Support could be given this route at Le Kef from Sousse and Sfax.

Even though the terrain is less rugged and more open in southern than in northern Tunisia, transportation routes are limited by physiographic obstacles. The route of supply from Tripoli into Algeria is confined to the coastal plain as far as Gabès by the sharply rising escarpment to the southwest. About 20 miles south of Gabès this escarpment narrows the coastal plain to a width of approximately 12 miles. It is in this area that the French built their African Maginot line. Beyond Gabès the road continues through steppe country to Gafsa. Immediately south of the line drawn between Gabès and Gafsa are the Tunisian Shotts, salt pans which are very dangerous to traverse. From Gafsa the road extends northwest to Tébessa in Algeria and crosses the Tébessa mountains in which maneuver is difficult. The relief in this sector is characterized by sandstone or limestone domes and basins, aligned northeast-southwest. The purpose of an attack from Tripoli to Tébessa would be to penetrate the southern anchor of the Algerian defenses and thus outflank the defending forces.

The desert terrain west of Gabès to Biskra is difficult to cross. Shotts, wadies, and sand are obstacles to movement, and should probably not be considered an important avenue of attack.

The coastal road between Tripoli and Bizerte would offer an excellent behind-the-lines supply line serving each advancing column.

The first objectives of an enemy advance into Algeria would be Bône, Souk Ahras, and Tébessa, arranged in a north-south line. They are connected with each other by highway and railroad and each is a focus of transportation routes. It would be possible to establish defense positions at each of these points. A few miles southeast of Bène, near Morris, the coastal plain is narrow, having the sea to the north and hills to the south. Both Souk Ahras and Tébessa are in mountainous country which would facilitate defensive measures. Secondary defensive positions to the west are at Constantine and Philippeville.

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## 2. CLIMATE AND WEATHER

### H. Northwestern Italy, Corsica, Sardinia, and Tunisya

Conditions at Axis bases.

Climatically, Genoa-Leghorn coast, Corsica, and Sardinia are excellent bases for aerial activity in winter. Visibility is good. Genoa, with visibility below two nautical miles only two or three times per month in winter, has somewhat better conditions than Leghorn. Fog is rare, but clouds, mostly low, have an average coverage of 50% in winter.

The clouds are associated with storms that bring the heavy winter rains. Heaviest winter rains occur in October or November. The rainfall at Genoa, even in December, still amounts to nearly 5 inches, and is concentrated in 11 days. Southward, in Corsica and Sardinia, rainfall at the coastal and lowland stations is much less than at Genoa, but the number of rainy days and percentage of cloudiness are about the same. The southern part of Sardinia, around Cagliari, is the driest part of the two islands. On both the mainland and the islands, traffic away from paved roads is much hampered by the mud associated with the winter rains.

Conditions along Axis land supply route.

Genoa has all-season connections by road and railroad with Germany. The coastal route to France is mild and snowfree even in winter. Passes through the Apenines to the north of Genoa are low and warm enough so that the occasional snowfalls can be quickly removed. The passes of the Alps receive heavy snowfall throughout the winter, and most roads are closed at this season. The railroads, however, are kept open all winter.

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## Conditions at sea.

Sea movement from Genoa to Tunisia can pass either to the east or west of Corsica and Sardinia. Climatically, there is little to choose between these routes. Both routes are rather stormy in the north, with 3 or 4 gales per month in winter on the average, and both routes have prevailingly northerly winds in the north. Opposite Sardinia, the western route has pronounced northwest and west winds, which would favor an approach to Bizerte, while the eastern route has no distinct prevailing wind, and very few gales, and would be somewhat better for return trips from Tunisia. Because of the slightly greater directness of the eastern route, and its greater protection from Italian bases, one would expect this route to be used in preference to the other.

## Conditions at Axis objective areas.

Landing conditions are much more favorable east of Bizerte than west. Western Tunisia and eastern Algeria are the rainest part of the French North African coast, while from Tunis south much drier conditions prevail. Thus, the difference in the objective area favor the eastern approach. For additional details, see the last portion of the section on Southern Italy, Sicily, and Tunisia.

## B. Southern Italy, Sicily and Tunisia *

### Conditions at Axis Bases

The coast of southwestern Italy, from Naples to Sicily, is on the whole favorable for sea and air operations. This is true even in winter. However, land operations away from paved roads may be hampered by mud resulting from the heavy rainfall. Four to five inches of rain falls in both December and January, spread out over 15 days per month. Storms, which commonly last from one to three days each, are accompanied by clouds and shifting winds.

The north coast of Sicily is particularly cloudy, though mean December cloud coverage is between 50 and 65% in all southwestern Italy. Winter winds, seldom of gale velocity, may blow from any direction, but are most commonly from the north at Naples, northwest in the Strait of Messina, and southwest at Palermo. Fog is expected less than once a month. Visibility is adequate for aerial activity most of the time, though is not as perfect as in most of the rest of the Mediterranean. Naples, which in some respects has the poorest winter visibility conditions of any western Mediterranean station, has only ten days per winter month with visibility less than 2 nautical miles at 7 A.M., four days at 1 P.M., and only one day a month with visibility below 1/2 mile. Southern Sicily and the sheltered "heel" area of Italy have less rainfall and better conditions and visibility than the more exposed "toe" area and northern Sicily.

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*See maps and text in Climate and Weather Appendix for additional details

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## Conditions Along Axis Supply Route

No serious climatic obstacles exist for highway and rail travel from northern Italy to the south. Several passes at elevations of 1600 to 3000 feet in the Apennines are visited by occasional snowstorms but can be kept open with little interruption of traffic. Dirt roads may of course become impassable when wet.

## Conditions at Sea

The direct sea route from Naples to Bizerte and Tunis is more favorable for sea travel than the route around southern Sicily. Along the northern route, winds are moderate, seldom of gale force, and blow nearly equally from all points of the compass. As the Tunisian coast is approached, pronounced crosswinds from the northwest are encountered.

The route to Tunis south of Sicily has strong head winds from the northwest and west, and gale velocities occur 2 or 3 times a month in winter.

## Conditions at Axis Objective Areas

Northern Tunisia has bad ground conditions much of the time in winter due to heavy rains. Bizerte has as much rain as southwestern Italy in December, and even more in January, the wettest month of the year. Half the days of December and January are rainy. Dirt roads and open country may become impassable for wheeled vehicles, and floods of the Medjerda River sometimes add to the difficulties of land operations. Rainfall decreases rapidly southward. Tunis gets only half as much rain as Bizerte in the two wettest months, and

Gabes, in the far south, has desert rainfall conditions. Eastward from Gabes, midwinter rainfall is high only in a small coastal patch around Tripoli.

Conditions of the sea for landing operations are relatively poor along the north coast of Tunisia, judging by the nearby Algerian coast, for which data are available. Southward in Tunisia, landing conditions are much better. At Tripoli they are again poor, as the following table indicates.

| | Number of days per winter (Dec.-Feb.) with calm or slight sea | Number of days per winter with heavy swell or rough sea. |
|---|---|---|
| North Coast (Est.) | About 50 | 20-30 |
| Gabes | 76 | 1 |
| Tripoli | 40 | 14 |

The winter climate of Tunisia is well-suited to aerial operations. Visibility is superior along the entire coast. At Tunis, only one day per month in winter has visibility below 2 nautical miles, and then only in the early morning. Visibility exceeds 10 miles half the time. Fog is virtually unknown. Against high-level bombing, however, cloudiness approaching 60% in the north provides considerable protection. Cloudiness is less along the southern coast, amounting to only about 40%.

From the viewpoint of winter climate, southern Tunisia is more suitable for landing, ground and air attact then northern Tunisia.

The climatic factors which render Tunisia vulnerable to air attacks make it also an excellent base for carrying on air attacks upon Algeria by the Axis or upon Sicily and Tripoli by the United Nations. As an Axis base for land operations against Algeria, Northern Tunisia is handicapped by winter conditions of mud.

## 3. HEALTH CONDITIONS

It is not probable that health factors constitute any serious handicap either to a German military movement through Italy or to an occupation of Southern Italy, Sardinia, and Sicily for a longer period. There is no danger from malaria on the Italian mainland or on the islands between November or December and June. The Italian Government has successfully combatted the malaria menace. It may be assumed that during the summer months it is under reasonably effective control. It should be stated that the Axis is suffering from an acute quinine shortage. In Sardinia sandfly fever may incapacitate troops alien to the Mediterranean area, if simple precautions are not taken. German experience in Africa is sufficient indication that such preventive measures will be taken. Undulent fever, endemic in Sardinia, can also be prevented.

For many diseases the Italian death rate is not so very different from the corresponding German figures. The Italian rate, however, is considerably higher for typhoid, paratyphoid, bronchitis, pneumonia, diarrhea, enteritis, and nephritis.

The following table gives the death rate per 100,000 inhabitants in Italy (1937) and Germany (1936) for certain diseases:

| Causes of Death* | per 100,000 inhabitants<br>Italy 1937 | Germany 1936 |
|---|---|---|
| Typhoid and paratyphoid fever | 11.8 | 0.8 |
| Typhus fever | 0.0 | 0.0 |
| Smallpox | 0.0 | 0.0 |
| Measles | 4.9 | 2.7 |
| Scarlet fever | 0.7 | 1.9 |
| Whooping Cough | 6.3 | 4.6 |
| Diphtheria | 6.3 | 10.9 |

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* Annual Epidemiological Report of the League of Nations for the Year 1938, Geneva, 1941, p. 75.

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| Causes of Death* | per 100,000 inhabitants<br>Italy<br>1937 | <br>Germany<br>1936 |
|---|---|---|
| Plague | 0.0 | 0.0 |
| Tuberculosis of respiratory system | 63.2 | 59.7 |
| Other forms of tuberculosis | 22.4 | 10.8 |
| Syphilis | 4.4 | 3.5 |
| Malaria | 2.4 | 0.1 |
| Other infectious or parasitic diseases | 20.7 | 12.0 |
| of which Acute Poliomyelitis | 0.8 | 0.5 |
| " " Cerebro-spinal meningitis | 0.5 | 1.2 |
| Cancer and other malignant tumours | 85.3 | 146.5 |
| Tumors, non-malignant, or of which the nature is not specified | 4.4 | 7.9 |
| Chronic rheumatism and gout | 3.4 | 3.4 |
| Diabetes mellitus | 9.8 | 19.3 |
| Alcoholism (acute and chronic) | 1.3 | 0.6 |
| Other general diseases and chronic poisonings | 19.1 | 15.7 |
| Progressive locomotor ataxia and general paralysis of the insane | 2.5 | 4.8 |
| Cerebral haemorrhage, cerebral embolism and thrombosis | 133.0 | 97.0 |
| Other diseases of the nervous system and of the organs of special sense. | 34.9 | 28.6 |
| Diseases of the heart | 162.6 | 150.2 |
| Other diseases of the circulatory system | 37.3 | 47.3 |
| Bronchitis | 42.4 | 16.5 |
| Pneumonia | 200.7 | 88.1 |
| Other diseases of the respiratory system (tuberculosis excepted) | 24.0 | 24.7 |
| Diarrhoea and enteritis | 131.9 | 17.2 |
| of which under two years | 47.9 | 6.8 |
| Appendicitis | 6.9 | 8.2 |
| Diseases of the liver and biliary passages | 19.8 | 18.6 |
| Other diseases of the digestive system | 31.1 | 30.4 |
| Nephritis | 43.1 | 17.8 |
| Other diseases of the genito-urinary system | 14.6 | 19.6 |

| Causes of Death* | per 100,000 inhabitants<br>Italy<br>1937 | <br>Germany<br>1936 |
|---|---|---|
| Puerperal septicemia | 1.1 | 1.8 |
| Other diseases of pregnancy, childbirth and the puerperal state | 1.7 | 2.9 |
| Diseases of the skin and cellular tissue and of the bones and organs of locomotion. | 8.4 | 7.9 |
| Congenital debility and malformations, premature birth and other diseases of early infancy. | 31.9 | 34.5 |
| Senility | 97.0 | 106.2 |
| Suicide | 7.6 | 28.6 |
| Homicide | 1.8 | 1.2 |
| Violent and accidental deaths (suicide and homicide excepted) | 33.5 | 43.5 |
| Cause of death not specified or ill-defined | 11.4 | 21.5 |
| | 1,417.9 | 1,181.6 |

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* Annual Epidemiological Report of the League of Nations for the Year 1938, Geneva, 1941, p. 75.

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## 4. COMMUNICATIONS

### A. Transportation

### The Possibilities of Moving a German Army into Italy.

### I. Conclusion

The following possibilities are open to Germany, should she decide to move an army into Italy, either for transshipment to points in North Africa or to protect Italy against an Allied invasion:

It would be possible to move a total of 212 trains, or about three divisions, daily for six consecutive days into Italy. This figure represents approximate maximum capacity. All these trains could be unloaded within two days at point south of a line drawn on the map between Naples and Foggia. Half a division, or 37 trains, could be transported to Sicily daily. Therefore, in one week 17 divisions, and in two weeks 34 divisions, could be transported to southern Italy and Sicily.

An alternative possibility would be the diversion of troop and supply trains for embarking at the ports on the east and west coasts of Italy from north to south. This would reduce the strain on the railroads and would utilize the maximum capacity of the Italian ports, but the total number of divisions that could be moved into Italy would remain the same.

Highway transport is not considered.

### II. The Transportation Problem

#### 1. Scope of a possible movement of an army into Italy.

Germany is in possession of a great number of lines of considerable capacity in France, Alsace Lorraine, South Germany, Austria and Jugoslavia, which connect with the Swiss and Italian border points. Therefore, the scope of the transportation of an army into Italy is determined primarily by the capacity of the mountain lines and other approaches running into Italy from the west, north, and east.

#### 2. Possible movements over the frontier points.

According to a reliable source,* the main frontier lines have the following capacities:

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* British Handbook on Italian Railways, p. 2.

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| Route | Italian Frontier Station | No. of trains per day in each direction | Main connections from |
|---|---|---|---|
| **French Routes** | | | |
| Riviera | (Ventimiglia) | 24 | Toulon - Marseilles |
| Mont Cenis | (Modane) | 30 | Besancon - Belfort - Strassburg |
| **Swiss Routes** | | | |
| Simplon | (Domodossola) | 42 | Lausanne - Dijon - Paris |
| | | | Basel - Mülhausen - Strassburg |
| | | | Basel - Karlsruhe - Rhineland |
| St. Gotthard | (Chiasso) | 72 * | Luzern - Basel - Karlsruhe |
| | | | Zürich - Schaffhausen - Stuttgart - Würzburg |
| | | | Zürich - Basel - Karlsruhe |
| | | | Zürich - Lindau - Munich |
| **German Routes** | | | |
| Brenner | (Brennero) | 72 | Innsbruck - Munich - Nurnberg - Berlin |
| | | | Innsbruck - Salzburg - Linz - Berlin |
| | | | Innsbruck - Salzburg - Linz - Vienna |
| Tarvisio | | 24 | Villach - Salzburg - Munich |
| | | | Villach - Klagenfurt - Bruck - Vienna |
| | | | Villach - Klagenfurt - Marburg - Budapest |
| **Former Yugoslav Routes** | | | |
| Piedicolle | | 18 | Rosenback - Villach and connections |
| | | | Rosenback - Bruck - Vienna |
| Postumia | | 36 | Laibach - Marburg - Budapest |
| | | | Laibach - Zagreb - Budapest |
| Fiume | | 12 | Ogulin - Zagreb - Budapest |
| Total Train Capacity of Italian Approaches | | 330 | |

* Other English sources give the capacity as 60.

For the purpose of determining the possible use of these lines, the following assumptions have been made:

(1) The circuitous route from the French Riviera will not be used.

(2) The Swiss routes (Simplon and St. Gotthard) will be used only for supply movements. Since in all probability the Swiss will not consent to a complete suspension of trains scheduled for purely Swiss traffic, the Axis will be able to preempt at most one-third to one-half of the capacity of the Swiss lines.

(3) The other routes will be used to capacity. Allowance should be made, however, for a small number of trains that will be necessary for purposes other than the transfer of troops and supplies.

Consequently, the following number of trains per day could move over the frontier points:

| | Trains per day in each direction |
|---|---|
| French Routes | |
| Mont Cenis | 26 |
| Swiss Routes | |
| Simplon | 14 |
| St. Gotthard | 24 |
| German Routes | |
| Brenner | 68 |
| Tarvisio | 22 |
| Former Yugoslav Routes | |
| Piedicolle | 16 |
| Postumia | 32 |
| Fiume | 10 |
| Total number of trains per day | 212 |

3. The Movement in Italy.

(a) Capacity of the Italian railroad system.

Map I shows the capacity of the Italian railroad system. The number of trains per day is indicated by the width of the lines as explained in the legend. The following figures are the basis for computing

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the capacity of each line.

| | | Trains per day in each direction |
|---|---|---|
| **Electrified lines** | | |
| Double track | | 96 |
| Single track | | 24 |
| **Steam lines** | | |
| Double track | | 72 |
| Single track | I Class | 24 |
| | II Class | 12 - 15 |

(b) Operations in Italy.

Map II indicates the flow of troop and supply trains in Italy. The number of trains which may be operated over each route is indicated by the width of the lines, and the number of trains by the figures on the lines. The insert shows the time needed for this movement from the main points in Alsace-Lorraine, Germany and southwestern Hungary.

It is assumed that all roads necessary will be used to their capacity. It is further assumed that Germany desires to move the maximum number of troops into Southern Italy and Sicily.

Map II shows, first, that it is possible to move all daily incoming trains into an area south of a line drawn from Naples to Foggia for debarkation; second, that this can be accomplished within two days for all troop and supply trains coming from Alsace-Lorraine, southern Germany, Austria, and southwestern Hungary.

Movements into Sicily other than coastwise shipping are determined by the capacity of the two lines leading to Reggio di Calabria. On these lines not more than 37 trains per day can be operated in each direction. It is possible to handle between 20 to 30 trains on the train ferries from Reggio di Calabria and the adjoining port of Villa San Giovanni to Messina. It can be assumed, however, that only cars carrying vehicles and cargo are transshipped on the ferries, and other craft will be made available for carrying troops. Therefore, the 37 trains mentioned above can be transshipped to Messina or adjoining landing places.

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(c) Debarkation points.

For this whole general movement, the points of debarkation are indicated on the map:

| | Number of trains per day |
|---|---|
| A. In Southern Italy | |
| 1. Naples and adjoining stations (Salerno, etc.) | 101 |
| 2. Between Benevento and Foggia | 35 |
| 3. Between Foggia and Bari | 22 |
| 4. Brindisi | 15 |
| B. In Sicily | |
| 5. Palermo | 14 |
| 6. Trapani | 10 |
| 7. Catania | 5 |
| 8. Syracuse | 5 |
| 9. Licata | 5 |
| | 212 |

(d) Periods of operation.

The movement as outlined above can be continued 6 days during a week. One additional day will be needed for maintenance work on electric lines and for bringing delayed transports into the proper schedules.

(e) Locomotives and cars.

According to the O.S.S. study on the Locomotive Position of Axis-dominated Europe, (Report No. 86), dated 10/20/42, Italy possesses at the present time about 3,000 steam locomotives and about 1,700 electric locomotives. Many of the electric locomotives are modern and powerful units. Italy, therefore, is in a position to supply the necessary tractive power for these movements over a considerable length of time if all other Italian traffic is discontinued, so far as this is necessary. Freight and passenger cars will be available in Germany for the whole movement.

## III. Number of Divisions Transported

It can be assumed that the supplies for each division will be transported along with the troop movements. (The two exceptions to this general rule would be troop movements coming from the east and supplies coming over the Swiss routes.) For this reason, 75 trains of 50 cars each will be necessary for each division. Consequently, about 3 divisions can be transported daily for six consecutive days. In one week about 17 divisions, and in two weeks about 34 divisions, could be transported. The operation of extra supply trains may become necessary two weeks after the departure of each division from its point of embarkation. This would involve operation of one train daily per division for supplies of all kinds.

With 34 divisions in Italy, this would necessitate 34 trains per day, and would present no problem whatsoever.

## IV. Alternative Possibilities

Instead of routing all trains to the south of Italy and Sicily, some may be diverted for embarkment at the ports on the east and west coasts along the length of the peninsula from north to south. The number so diverted would vary in each case according to the capacity of the port in question. Estimates of the daily capacities of the principal Italian ports are given below and more fully explained in No. 6. The load of each train is assumed to be one thousand tons. In all cases, the lines leading to the ports are adequate for the necessary number of trains. Such a plan would have the advantage of utilizing the maximum port capacity of Italy.

West Coast
(North to South)

| | | |
|---|---|---|
| Savona | 9,000 | metric tons |
| Genoa | 16,000 | " " |
| La Spezia | 2,500 | " " |
| Leghorn | 7,000 | " " |
| Piombino | 2,500 | " " |
| Civita Vecchia | 3,500 | " " |
| Gaeta | 300 | " " |
| Bagnoli | 3,500 | " " |
| Naples | 14,000 | " " |
| Castellamare | 1,500 | " " |
| Reggio | 1,000 | " " |
| Total | 60,800 | " " |

East Coast
(North to South)

| | | |
|---|---|---|
| Fiume | 3,000 | metric tons |
| Pola | 1,200 | " " |
| Trieste | 12,000 | " " |
| Venice | 14,000 | " " |
| Ancona | 2,000 | " " |
| Bari | 3,000 | " " |
| Brindisi | 500 | " " |
| Taranto | 800 | " " |
| Total | 36,500 | " " |

The daily capacities of the principal Sicilian ports are as follows:

| | | |
|---|---|---|
| Augusta | 300 | metric tons |
| Catania | 2,500 | " " |
| Marsala | 300 | " " |
| Messina | 2,000 | " " |
| Milazzo | 300 | " " |
| Palermo | 4,000 | " " |
| Syracuse | 1,500 | " " |
| Trapani | 800 | " " |
| Total | 11,700 | " " |
| West Coast | 60,800 | " " |
| East Coast | 36,500 | " " |
| Total Port Capacity for Italy and Sicily | 109,000 | " " |

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## B. Telegraph, Telephone, Radio.

1. The Italian telegraph is adequate for any military movement within Italy, the Islands and Libya. There is telegraphic communication with the islands Corfu, Sicily, Sardinia, Corsica; Yugoslavia, Albania, Greece, Turkey, and North Africa. The Sardinia cable connects Marinella with the peninsula at Ansedonia.

As of June 30, 1940, Italy had 16 national coastal marine radio telegraph stations.

The Coltana radio station can maintain wireless connection with vessels throughout the world by means of short wave, and with vessels in the Mediterranean Sea by medium-wave apparatus.

There is reported to be a wireless system between railway headquarters in Rome and the various regional headquarters. All the larger naval and air bases are equipped for radio communication. Along the entire railway system there are adequate telegraphic and telephonic connections.

2. Italian telephones connect with almost every part of Italy and many European capitals: The Sardinia cable connecting Marinella with the mainland at Ansedonia was also equipped to transmit telephone messages. Most international and interurban telephone circuits are encased in underground cables.

Geographic distribution of telephone service: (Number of communes in each compartimento provided with telephone service - as of December 31, 1940)

| Compartimenti | Number of communes in compartimento | Number of communes provided with telephone service |
|---|---|---|
| Abbruzzi e Molise | 423 | 277 |
| Calabrie | 395 | 202 |
| Campania | 476 | 263 |
| Emilia | 337 | 326 |
| Lazio | 352 | 223 |
| Liguria | 219 | 154 |
| Lombardy | 1389 | 1298 |
| Lucania | 123 | 47 |
| Marche | 230 | 209 |
| Piedmont | 1066 | 845 |

Georgaphic distribution (continuation of table):

| Compartimenti | Number of communes in compartimento | Number of communes provided with telephone service |
|---|---|---|
| Puglie | 244 | 178 |
| Sardinia | 275 | 80 |
| Sicily | 353 | 217 |
| Tuscany | 276 | 234 |
| Umbria | 88 | 88 |
| Veneto | 740 | 643 |
| Venezia Giulia e Zara | 129 | 108 |
| Venezia Tridentian | 219 | 183 |

3. New developments in telegraph and telephone.

In 1938, the Italian press announced plans for a submarine telegraph and telephone cable to link Caltanissetta in Sicily and Tripoli in Libya. The longest link was to be from the island of Lampedusa to Tripoli.

In 1939, the Italian Government provided for the laying of a submarine telegraph between Brindisi and Durazzo in Albania. Construction was to include an underground telephone cable between Brindisi and Bari, with branches at Taranto; and overhead telephone wires in Albania, between Durazzo and Tirana.

## 5. VITAL AREAS

a. Industry. The most important vital area of Italy is the highly industrialized area of northern Italy. Most of Italy's war industries and transportation facilities are concentrated in this region.

b. Transportation. The vital and vulnerable points in Italy's system of transportation with reference to possible troop movements from Germany are as follows:

1. The Brenner Pass and its approaches from the North and South. This pass on the frontier between Germany and Italy constitutes the point over which the heaviest traffic from the north moves into Italy. The railway line here has a maximum capacity of 72 trains daily in both directions. This represents 35 percent of the 212 total trains which the Germans would probably employ in any movement into Italy. It represents 22 percent of all the possible 330 trains which can be operated over the frontier points from France, Germany, Austria, and Jugoslavia. Particularly vulnerable is the line on the southern approach to the Pass, between Moncucco (8 kilometers from the Pass; altitude - 1,241 meters) and Colle Isarcco (17 kilometers from the Pass; altitude - 1,065 meters). There are three bridges and one tunnel on this hair-pin curve. The destruction of one or all of these would contribute much to the disruption of the traffic between Germany and Italy. The railway stations at Innsbruck and Bolzano, the two most important junctions south and north of the Pass, have a daily maximum capacity of 72 troop trains in both directions.

2. Genoa is not only the greatest Italian port but also a very important railway junction. It has an estimated capacity of 96 troop trains daily. The coastal line from Genoa to Rome includes many vital and vulnerable points (bridges and tunnels). North of La Spezia, between Manarola and Framura, the coastal railway passes through an all but continuous tunnel. Up to August, 1939, this railway line still had only a single track.

3. Trieste is a great port and also an important railway center (52 trains).

4. Milan and its environs, with an estimated capacity of 90 troop trains daily, are a very important area for railway operations.

5. Bologna, with a capacity of 116 troop trains converging from Milan, Verona, Trieste, and Ancona, is one of the most vital railway centers of Italy.

6. Rome is a junction point where probably the greatest number of trains will be operated at one and the same time - namely, 188 troop trains daily.

7. Naples is important as port and railway center. The troop train capacity estimate for Naples is 172 trains daily.

8. The Straits of Messina between Reggio di Calabria and Messina are used for operating train ferries from the mainland to Sicily. There are six ferry boats. Two of them have a capacity of 28 cars; one has a capacity of 20 cars; and three have a capacity of 8 cars. The railway connections between the mainland and Sicily depend on these ferries. During heavy troop movements these ferries will probably operate twenty-four hours a day. They are capable of handling 20 - 30 trains a day. Other vessels may be used for transporting troops across the Straits.

9. The major locomotive workshops of Italy are: Genoa, Bologna, Rome and Turin. Ordinary locomotive repair shops in Southern Italy and Sicily are at: Bari, Foggia, Messina, Naples, Reggio di Calabria, Taranto, Catania, Palermo, Villa San Giovanni (near Reggio).

10. Electric power distribution is so organized in Italy that a number of power stations can be made to serve the same line. The destruction of a single station will, therefore, not necessarily disrupt the service.

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## 6. PORTS AND NAVAL BASES

### A. Principal Ports

Complete confidence cannot be placed in the estimates of the DAILY LOADING CAPACITY of PRINCIPAL ITALIAN PORTS (Table). The estimates have been based on the following sources:

Columns 1 and 2 give the Average Daily Tonnage Debarked and Embarked in 1938 or 1939, whichever was the larger. The daily averages have been computed from the annual totals (*Annuario Statistico*, Rome 1941, p. 160) on the assumption of three hundred working days per year.

Column 3 gives ESTIMATED DAILY *UNLOADING* CAPACITY as derived from an official British publication of January 1942.

In basing estimates on these data, attention has been given to the following factors which are not susceptible of exact mathematical treatment:

a) On the advice that rates of *UNLOADING* and *LOADING* are roughly equal, the British figures have been accepted where given, unless the data in Columns 1 and 2 required a higher estimate.

b) The estimates are based on the assumption that little or no *debarkation* will be taking place in the ports when *embarkation* of an expeditionary force is under way. Since more cargo can obviously be *loaded* in a port when none is being *unloaded*, some weight has been given to the *combined* daily averages for debarkation and embarkation, i.e. Column 1 plus Column 2.

c) The averages in Columns 1 and 2 are *peacetime* averages, which would be increased in some respects for the embarkation of an expeditionary force: e.g., priority for military transport, a twenty-four hour day, etc.

d) On the other hand, blackouts would hamper night work, even in the absence of bombing.

e) For some of the ports, e.g. Genoa, a large proportion of peacetime cargo is *bulk* cargo - coal, oil, grain, etc. Military stores cannot be handled as rapidly as bulk cargo.

f) The estimates have been proportionately raised for those ports which in peacetime had an extensive passenger traffic on large ships, such as Genoa, Naples, Trieste, Fiume and Palermo.

## B. Lesser Ports

Inasmuch as troops and supplies can be moved into Italy more rapidly than they can be embarked at the Italian ports, and for other reasons as well, embarkation may take place on small ships at a number of lesser ports. Some of these, for which the tonnage capacity cannot be estimated, may be listed as follows.

### Mainland

BARLETTA: embarkation point for the Dodecanese; otherwise of little importance.
CARRARA, MARINA di
CHIOGGIA
CROTONE: small commercial port
FOLLONICA
GALLIPOLI
GELA
MOLFETTA
MONOPOLI
OTRANTO
PESARO
PISA, MARINA di
POZZUOLI
RAVENNA
ROSE, PORTE
SALERNO
SAN REMO
SESTRI LEVANTE
TORRE ANNUNZIATA
VIAREGIO
VILLA SAN GIOVANNI: terminal point on train-ferry between Reggio and Messina

### Sicily

EMPEDOCLE PORTO (AGRIGENTO): principal port on south coast
LICATA, PORTO di: small commercial port on south coast.

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# CAPACITIES OF PRINCIPAL ITALIAN PORTS

| PORT | AVERAGE DAILY TONNAGE 1938 or 1939 (Metric Tons) DEBARKED (1) | EMBARKED (2) | ESTIMATED DAILY UNLOADING CAPACITY BRITISH (Dead Weight or Long Tons) (3) | ESTIMATED DAILY LOADING CAPACITY (Metric Tons) (4) |
|---|---|---|---|---|
| **MAINLAND** | | | | |
| Ancona | 1,970 | 343 | | 2,000 |
| Bagnoli | 3,280 | 687 | | 3,500 |
| Bari | 1,553 | 873 | 3,000 | 3,000 |
| Brindisi | 417 | 130 | | 500 |
| Castellamare | | | 1,500 | 1,500 |
| Civita Vecchia | 3,493 | 530 | | 3,500 |
| Fiume | 1,727 | 1,417 | | 3,000 |
| Gaeta | | | 300 | 300 |
| Genoa | 21,747 | 4,220 | 10,000<br>(berthing accommodations to handle 16,000/20,000) | 16,000 |
| La Spezia | 2,997 | 743 | 1,500/2,000 | 2,500 |
| Livorno (Leghorn) | 5,197 | 2,030 | 6,000-8,000 | 7,000 |

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| PORT | AVERAGE DAILY TONNAGE 1938 or 1939 (Metric Tons) | | ESTIMATED DAILY UNLOADING CAPACITY BRITISH (Dead Weight or Long Tons) | ESTIMATED DAILY LOADING CAPACITY (Metric Tons) |
|---|---|---|---|---|
| | DEBARKED | EMBARKED | | |
| | (1) | (2) | (3) | (4) |
| Naples | 6,923 | 1,570 | 8,000-16,000 | 14,000 |
| Piombino | 2,430 | 560 | | 2,500 |
| Pola | 897 | 630 | | 1,200 |
| Reggio | | | 1,000 | 1,000 |
| Savona | 7,833 | 1,403 | | 9,000 |
| Taranto | | | 800 | 800 |
| Trieste | 7,903 | 3,587 | | 12,000 |
| Venice | 12,753 | 3,217 | | 14,000 |
| SARDINIA | | | | |
| Alghero Porto)<br>)<br>+ Conte Porto) | | | 200 | 200 |
| Cagliari | 1,077 | 2,150 | 3,000 | 3,000 |
| Maddelena | | | 200/300 | 300 |
| Terranova Pausan | | | 300/500 | 500 |

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| PORT | AVERAGE DAILY TONNAGE 1938 or 1939 (Metric Tons) |  | ESTIMATED DAILY UNLOADING CAPACITY BRITISH (Dead Weight or Long Tons) | ESTIMATED DAILY LOADING CAPACITY (Metric Tons) |
|---|---|---|---|---|
|  | DEBARKED (1) | EMBARKED (2) | (3) | (4) |
| **SICILY** |  |  |  |  |
| Augusta |  |  | 300 | 300 |
| Catania | 1,353 | 720 | 2,500/2,800 | 2,500 |
| Marsala |  |  | 300 | 300 |
| Messina | 1,027 | 343 | 2,000 | 2,000 |
| Milazzo |  |  | 300 | 300 |
| Palermo | 1,880 | 570 | 3,000/4,200 | 4,000 |
| Syracuse | 277 | 277 | 1,000/1,600 | 1,500 |
| Trapani | 290 | 850 | 600/800 | 800 |

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## 7. AIR BASES

See attached Map - Italy, Aerodromes and Landing Grounds.

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## 9. POPULATION

A. Attitude of the Population. The present government of Italy appears to be stable. The Fascists retain effective leadership and are aided by two powerful forces in Italian life, the Monarchy and the Catholic Church. The Fascist regime, the Monarchy, and the Church are united in an effort to preserve the integrity of the Kingdom and the power of the present government against foreign and domestic enemies. The foreign enemies include the nations with which Italy is at war and may also include Italy's present ally, Germany, whose increasing power in Italy is a matter of great concern to ruling Italian circles. This concern takes the form of limiting German control in Italy rather than of repudiating the German alliance, which, from many viewpoints, has proved helpful to Italy, as, for example, in the Greek and the North African campaigns.

B. Regional differences. Social distinctions are linked with strong local or regional feeling. This feeling is based on "racial", historical, economic, and linguistic differences. Regionalism is less acute than formerly, because of the steady growth of national consciousness. The northern Italian's traditional sense of superiority over the southern Italian has declined in recent years. That sense of superiority was chiefly due to the greater economic prosperity of the North, and partly due to "racial" differences between the Alpine northerners and the Mediterranean southerners.

Much local feeling persists in northern, central, and southern Italy: in northern Italy, among Genoese, Piedmontese, Lombards, and Venetians; in central Italy, among Tuscans, Romagnuoles and Romans; in southern Italy, among Sicilians, Neapolitans, and Sardinians.

## 8. LOCAL SUPPLIES

There is no available evidence on the existence of local supplies in Sicily, Sardinia, and Southern Italy sufficient to provide for an army of considerable size. It is assumed that any German army moving into or through Italy or the islands will carry its own supplies.

C. Statistics. The last Italian census is dated April 21, 1936. For population statistics, three groupings are used: (1) resident or "legal" population; (2) actual, present, or *de facto* population; (3) special population, i.e., *de facto* population plus those absent in Italian East Africa, the colonies, and the possessions.

D. Total population.

1. According to the 1936 census, the actual population of Italy was 42,444,588. According to an estimate of March, 1942, the population is 45,416,000.

2. Males and females. According to the 1936 census, Italy had a special population (in 000's) of 21,068 males and 21,851 females. According to an estimate for January 1, 1940, Italy had (in 000's) 21,700 males and 22,500 females.

3. Males of military age. An estimate for January 1, 1940 gives the following figures:

a. Ages 20-34: those constituting the main reservoir of military forces:

| | |
|---|---|
| 20-24 | 1,680,000 |
| 25-29 | 1,920,000 |
| 30-34 | 1,720,000 |
| Total | 5,320,000 |

b. Ages 15-19: categories now entering the armed forces:

2,030,000

c. Ages 15-64: productive ages:

| | |
|---|---|
| 15-19 | 2,030,000 |
| 20-34 | 5,320,000 |
| 35-39 | 1,450,000 |
| 40-44 | 1,240,000 |
| 45-49 | 1,060,000 |
| 50-54 | 972,000 |

| | |
|---|---|
| 55-59 | 871,000 |
| 60-64 | 749,000 |
| Total | 13,692,000 |

d. Occupational distribution. The following table shows the structure of the gainfully occupied population in 1936:

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### Structure of the Gainfully Occupied Population

### Distribution by Industrial Status and by Industrial Group
(1936)

| Industrial | Employers and independent workers | | | Salaried employees (including managers) | | | Wage earners | | |
|---|---|---|---|---|---|---|---|---|---|
| Group | Males | Females | Total | Males | Females | Total | Males | Females | Total |
| Agriculture, forestry, fishing | 2,589,554 | 285,015 | 2,874,569 | 21,200 | 737 | 21,937 | 1,869,415 | 563,730 | 2,433,145 |
| Mining and quarrying | 4,610 | 34 | 4,644 | 3,473 | 300 | 3,773 | 117,026 | 1,757 | 118,783 |
| Industry | 792,496 | 199,169 | 991,665 | 201,947 | 63,912 | 265,859 | 2,737,222 | 1,055,404 | 3,792,626 |
| Commerce, banking, insurance | 572,291 | 184,227 | 756,518 | 278,714 | 78,581 | 357,295 | 190,432 | 40,884 | 231,316 |
| Transport and communication | 152,792 | 2,191 | 154,983 | 100,215 | 24,736 | 124,951 | 396,807 | 7,016 | 403,823 |
| Professional service, religion | 90,895 | 20,863 | 111,758 | 76,455 | 62,135 | 138,590 | 16,481 | 2,452 | 18,933 |
| Public and private administration | 315 | 776 | 1,091 | 331,011 | 234,900 | 565,911 | 274,274 | 48,581 | 322,855 |
| Domestic service | * | * | * | 317 | 1,378 | 1,695 | 75,584 | 583,446 | 659,030 |
| Total | 4,202,953 | 692,275 | 4,895,228 | 1,013,332 | 466,679 | 1,480,011 | 5,677,241 | 2,303,270 | 7,980,511 |

* Figures do not exist.

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## Structure of the Gainfully Occupied Population (concl.)

| Industrial Group | Unpaid family workers | | | Total | | |
|---|---|---|---|---|---|---|
| | Males | Females | Total | Males | Females | Total |
| Agriculture, forestry, fishing | 1,931,543 | 1,581,591 | 3,513,134 | 6,411,712 | 2,431,073 | 8,842,785 |
| Mining and quarrying | 1,216 | 30 | 1,246 | 126,325 | 2,121 | 128,446 |
| Industry | 139,789 | 56,767 | 196,556 | 3,871,454 | 1,375,252 | 5,246,706 |
| Commerce, banking, insurance | 115,090 | 145,144 | 260,234 | 1,156,527 | 448,836 | 1,605,363 |
| Transport and communication | 17,235 | 1,209 | 18,444 | 667,049 | 35,152 | 702,201 |
| Professional service, religion | * | * | * | 183,831 | 85,450 | 269,281 |
| Public and private administration | 31 | 37 | 68 | 605,631 | 284,294 | 889,925 |
| Domestic service | * | * | * | 75,901 | 584,824 | 660,725 |
| Total | 2,204,904 | 1,784,778 | 3,989,682 | 13,098,430 | 5,247,002 | 18,345,432 |

* Figures do not exist.

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e. Population of important cities and communities.

1. Cities of 100,000 or over -- actual population as of December 31, 1939 -- official provisional figures:

| | |
|---|---|
| Apuania | 105,502 |
| Created in 1938, from the union of Massa, Carrara, and Montignoso. | |
| Bari | 215,720 |
| Bologna | 321,567 |
| Brescia | 136,704 |
| Cagliari | 121,581 |
| Calabria, Reggio di. See Reggio di Calabria. | |
| Catania | 254,697 |
| Ferrara | 123,719 |
| Firenze. See Florence. | |
| Florence (Firenze) | 355,614 |
| Genoa (Genova) | 661,961 |
| La Spezia | 120,599 |
| Leghorn (Livorno) | 136,430 |
| Livorno. See Leghorn. | |
| Messina | 204,858 |
| Milan (Milano) | 1,224,757 |
| Naples (Napoli) | 928,953 |
| Padua (Padova) | 152,799 |
| Palermo | 436,618 |
| Reggio di Calabria | 123,570 |
| Rome (Roma) | 1,327,118 |
| Spezia, La. See La Spezia. | |
| Taranto | 154,741 |
| Trieste | 261,809 |

| | |
|---|---|
| Turin (Torino) | 701,558 |
| Venice (Venezia) | 287,212 |
| Verona | 167,531 |

2. Certain communities of less than 100,000. Many of these, though small in population, have an economic or strategic importance. Actual population according to the 1936 census:

| | |
|---|---|
| Agrigento | 34,317 |
| Alessandria | 83,458 |
| Ancona | 89,710 |
| Angera | 3,870 |
| Aosta | 25,589 |
| Aquila degli Abruzzi | 53,517 |
| Ardenno | 2,504 |
| Arezzo | 60,665 |
| Arquata Scrivia | 4,034 |
| Ascoli Piceno | 38,833 |
| Asiago | 5,938 |
| Auletta | 2,819 |
| Aulla | 9,474 |
| Avigliana | 5,025 |
| Benevento | 38,013 |
| Bereguardo | 2,128 |
| Bergamo | 88,722 |
| Beseno | 2,239 |
| Biella | 28,883 |
| Bientina | 3,643 |
| Bollate | 9,430 |
| Bolzano | 52,787 |
| Borgofranco d'Ivrea | 2,726 |
| Borgomanero | 13,079 |
| Brennero | 3,277 |

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| | |
|---|---|
| Bressanone | 11,162 |
| Brindisi | 46,619 |
| Bussi sul Tirino | 3,883 |
| Caltanissetta | 49,943 |
| Campobasso | 29,413 |
| Carate Brianza | 8,685 |
| Carmignano | 12,198 |
| Castellammare di Stabia | 45,627 |
| Castellina in Chianti | 5,037 |
| Castelnuovo di Porto | 1,504 |
| Catanzaro | 46,044 |
| Cedegolo | 3,793 |
| Cengio | 2,923 |
| Cesano Maderno | 11,736 |
| Chioggia | 39,435 |
| Civitavecchia | 36,054 |
| Codigoro | 16,604 |
| Cogne | 1,784 |
| Colleferro | 4,162 |
| Comacchio | 13,152 |
| Como | 56,465 |
| Conegliano | 16,537 |
| Cortina d'Ampezzo | 5,343 |
| Cosenza | 41,143 |
| Cremona ed Uniti | 64,791 |
| Crotone | 21,625 |
| Cuneo | 38,758 |
| Curon Venosta | 2,559 |
| Dobbiaco | 2,313 |
| Dolcè | 2,486 |
| Dollegna del Còllio | 2,356 |

| | |
|---|---|
| Domodossola | 10,824 |
| Emilia, Reggio nell'. See Reggio nell' Emilia. | |
| Enna | 23,394 |
| Finale Ligure | 10,899 |
| Fiorenzuola d'Arda | 9,949 |
| Fiume | 56,249 |
| Fivizzano | 16,695 |
| Foggia | 63,847 |
| Foligno | 39,373 |
| Follonica | 5,669 |
| Forlì | 65,434 |
| Fornovo di Taro | 6,019 |
| Fossato di Vico | 2,700 |
| Frascati | 12,106 |
| Galatone | 11,264 |
| Gardone Val Trompia | 6,404 |
| Gerola Alta | 756 |
| Giove | 1,660 |
| Gorizia | 51,475 |
| Ivrea | 16,116 |
| Lago Santo | 4,619 |
| Lampedusa e Linosa | 4,165 |
| Lecce | 51,144 |
| Lonate Pozzolo | 5,253 |
| Lovero Valtellino | 834 |
| Lucca | 81,738 |
| Macerata | 27,474 |
| Mantua (Mantova) | 42,658 |
| Mascoli | 7,962 |
| Merano | 32,882 |

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| | |
|---|---|
| Misterbianco | 11,251 |
| Modena | 99,601 |
| Monfalcone | 19,656 |
| Monopoli | 28,102 |
| Montecatini | 5,139 |
| Monterotondo | 7,302 |
| Mòri | 5,498 |
| Muggia | 11,644 |
| Narni | 17,557 |
| Nicolosi | 3,265 |
| Novara | 66,077 |
| Orbetello | 11,741 |
| Orvieto | 23,189 |
| Oschiri | 3,927 |
| Ospedaletti | 3,308 |
| Parma | 75,768 |
| Passignano nel Trasimeno | 4,811 |
| Pavia | 52,851 |
| Perugia | 82,963 |
| Pescara | 50,980 |
| Piacenza | 79,648 |
| Piana dei Greci | 6,624 |
| Piedimulera | 1,996 |
| Pietrasanta | 20,612 |
| Pieve Vergonte | 1,974 |
| Piombino | 27,504 |
| Pisa | 75,875 |
| Pola | 54,515 |
| Ponte San Martino | 2,778 |
| Pontedera | 17,544 |

Poppi 8,744

Near Poppi is an Italian prison camp -- Campo di Prigionieri di Guerra 38.

| | |
|---|---|
| Portoferraio | 12,564 |
| Porto Tolle | 16,317 |
| Potenza | 25,494 |
| Prato allo Stelvio | 3,764 |
| Ravenna | 80,664 |
| Reggio nell' Emilia | 93,958 |
| Rho | 19,267 |
| Rimini | 63,871 |
| Ronchi dei Legionari | 6,515 |
| Rosignano Marittimo | 17,209 |
| Rovigo | 39,619 |
| San Candido | 3,498 |
| San Giusto Canavese | 2,129 |
| San Remo | 34,543 |
| Saronno | 28,725 |
| Sassari | 56,204 |
| Savona | 63,573 |
| Serra Ricco | 5,220 |
| Sesto Calende | 6,438 |
| Sesto San Giovanni | 35,639 |
| Sestri Levante | 15,475 |
| Settimo Torinese | 8,285 |
| Siena | 49,661 |
| Signa | 9,572 |
| Spilimbergo | 8,404 |
| Stra | 3,778 |
| Syracuse (Siracusa) | 54,295 |
| Taino | 1,604 |

| | |
|---|---|
| Tarvisio | 6,826 |
| Tenda | 2,730 |
| Teramo | 34,359 |
| Terni | 68,109 |
| Tirano | 7,243 |
| Tivoli | 21,140 |
| Trapani | 63,235 |
| Trento | 58,553 |
| Treviglio | 19,486 |
| Turbigo | 3,891 |
| Udine | 70,756 |
| Vado Ligure | 7,897 |
| Varese | 45,141 |
| Vecchiano | 8,332 |
| Ventimiglia | 16,762 |
| Vercelli | 41,154 |
| Vergiate | 3,989 |
| Viareggio | 34,395 |
| Vicenza | 70,529 |
| Vigevano | 37,622 |
| Villadossola | 4,701 |
| Villafranca di Lunigiana | 5,273 |
| Villanova d'Albenga | 1,163 |
| Vizzola Ticino | 472 |
| Zara | 22,844 |

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## SECTION D.

### Axis Capabilities
### For Movement through the Balkans.

Note: Factors other than terrain and climate in respect to Turkey are considered in Section F.

## 1. TERRAIN

### A. Terrain in Relation to German Movement Through The Balkans

A German thrust through the Balkans would be limited mainly by the topography and transportation facilities available, since presumably the peninsula is under Axis control excepting Turkey and the areas under guerrilla resistance. The mountains which form the major portion of the Balkan peninsula direct movement into specific routes which follow river valleys and passes. The terrain of these mountains is such that troop movements will take place in these routes which have already been utilized for the most part by railroads and roads which generally parallel each other.

A thrust to the south would be possible through four general routes; two of them by land and two by water. The first would be down the Danube River to the Black Sea with the object of attack from the Rumanian and Bulgarian coasts. This route would have the disadvantage of the slowness of transportation and would be entirely unusable in winter because the Danube freezes.

The second would be the sea route through the Adriatic and Aegean Seas with the object of attacking northern Africa or the invasion of Turkey and Cyprus from the west. This route however has the disadvantages of the distance involved and that of having only two ports which might be used as embarkation points - Trieste and Piume. Dalmatian ports would be of minor use since there are only two railways which connect the coast with the interior and they are both hazardous. One has very little capacity.

The other two are the main land routes to Greece and Turkey which will be used since they can easily be utilized for large scale troop movements southward although they cross areas of very rough terrain. The main route southward from Belgrade is through the Morava valley to Nish from which one route goes southward through the Vardar valley to Salonika while the other goes eastward to Sofia and down the Maritsa valley to Istanbul.

## Route from Belgrade to southern Greece

South of Belgrade the terrain is much rougher. The route passes through the Ripanj Tunnel of the Kosmaj Mountains to enter the valley of the Morava River. Southward the terrain gets more and more rugged and the valley narrower. From Stalach to Djunis there is a narrow rocky gorge. The country is one of high mountains with steep-sided valleys. There are many bridges over the Morava River. South of Nish the route continues in the Morava valley, crossing the divide at Preshevo at an elevation of about 1800 feet and continuing on to Salonika in the valley of the Vardar. The most difficult part of the valley is from Demir Kapija to Davidovo, the line being hemmed in by steep mountain sides (the "Iron Gate" of the Vardar). At Djevdjelija the route crosses the Greek-Yugoslav border. The Vardar valley widens and becomes a flat alluvial plain with many swamps.

## Alternate Route from Slavonski Brod to Salonika

The route from Slavonski Brod to Salonika is much longer and crosses more difficult terrain. Its use would necessitate transfer from standard to narrow gauge railways at Brod, and transfer back to normal gauge at Kraljevo. There are over 100 tunnels, and the capacity of the narrow gauge line is 10 light trains each way per day. In addition it goes through the territory held by the Guerrillas. At Komarica the line enters the Bosna valley following it to Sarajevo. The valley is very narrow, at Zhepche being just a rocky gorge. From Sarajevo the line turns east to Kraljevo, crossing the rough mountainous terrain of old Serbia. At Kraljevo it meets the Lapovo-Skoplje route which is an alternate to the Morava route. The line climbs the Ibar and Sitnica valleys crossing the divide at Babljak (elev. about 1800 feet) and then descends through the Lepenac valley to the Skoplje basin. At Skoplje it meets the main Vardar route following it to Velos. A very poor narrow gauge branch route extends southward to Tetovo, Gostivar, and Lake Ohrid. The terrain in this area is very mountainous with the Veles-Bitolj-Florina route crossing a pass with an elevation of 2500 feet. East of Florina it climbs through the Kirli Derven Pass (elev. about 2500 feet) to the basin of Lake Ostrov and then descends along the north slopes of the Voden valley to the flat Vardar plain on which is Salonika.

## Routes to the Dalmatian Coast

The long mountain chain stretching from the Alps through Yugoslavia, Albania, and Greece is an effective barrier to movement to the coast from the interior. From the Alps to Albania it is a bare dry karst region through which troops can move only with great difficulty. Only three routes reach the Dalmatian coast from the interior. The first is the Zagreb-Split standard gauge railway which crosses two passes having elevations of 2600 feet and 2894 feet.

A second route across the Dinaric Alps is from Frijedor to Knin where it meets the line to Split. From Srnetica there is a connection to Lasva on the Slovanski Bred-Sarajevo route. This line uses the rack system at Oborei where it crosses through the Komar Tunnel (elev. 2549 feet).

The railway across from Sarajevo to Dubrovaik and Boka Kotorska is the most difficult of all three. Between Sarajevo and Dubrovnik there are 34 tunnels. A rack system is still used between Bradina and Konjic. A two mile tunnel extends under Ivan Planina (Mt. Ivan) (elev. 2492 feet).

Routes to Southern Greece from Salonika

The main route southward from Salonika to Athens is on the east coast. From Salonika the route crosses the flat swampy Vardar plain turning south along the shore of the Gulf of Thermaikes. From Temi it enters the wide Thessaly plain of the Penios River through the "Vale of Tempe" gorge. From Larissa a route continues through the valley to Volos, the highest point being reached near Velestinen (elev. about 400 feet), to the small plain at the head of the Gulf of Volos.

From Larissa the route continues across the Thessaly plain crossing a small group of hills at Dhoxara (elev. about 500 feet), then rising steeply to cross the Othrys mountain range (summit of route about 1800 feet) and the basin of Lake Xynia to descend to the small Lania plain. It climbs a very steep cliff-like slope to enter the narrow Asopos gorge and the Bralo tunnel (elev. about 1225 feet). The route descends gradually down the Kifossos valley through the Parapotamia defile at Dhavlia. It reaches the Kopais plain and the Aonian plain and goes through a cut (elev. about 650 feet) near Tanagra to the Asopos plain. The route then climbs the Velitsi and Lioposi hills and reaches the col between the Pernis and Pendelikon mountains (elev. about 600 feet) to descend to Athens and Pirasus.

From Pirasus a narrow gauge line leads westward across the Isthmus of Corinth to Patras along the southern shore of the Gulf of Corinth. From Patras it follows the coast southward then leaves the coast and cutting across to the port of Kalamai. From Kalamai there is a route northeastward across the mountains to Argos on the Gulf of Argolis and northward to Corinth again. The coastal area is flat and often swampy while the interior is very mountainous.

## Routes through Bulgaria and Eastern Greece

The main route goes from Nish to Istanbul. From Nish the route follows the valley of the Nishava to the frontier where it then ascends the Yesevitsa valley to cross the Dragoman Pass (elev. 2201'). It then descends to the Sofia basin (elev. about 1700') climbing again to surmount the hill mass which joins the Rila mountains to the Sredna Gora. The summit is reached at Valkaral (elev. 2470'). After a steep descent into the small Ihitman basin it climbs to the Solu Dervent Pass (elev. 2400') after which it descends to the valley of the Maritsa river. At Belevo the line emerges on to the flat plain of Pasardjik and Plovdiv. Between Pasadjik and Kriehim the northern foothill of the Rhodopes jut out into the plain and the route is close to the river. Beyond Sadovo the valley narrows somewhat from Zlatidol to Harmanlii. From Svilengrad, on the Bulgarian border the route follows the Maritza River branching off up the valley of the Ergene River to the uplands of European Turkey and descending to Istanbul. Another route continues down the Maritza valley to Alexandropolis (Dedoagatch).

South of Sofia there is an important route southward through the Struma valley. The route goes southwest from the Sofia basin through hilly country turning south to the River Blato at Vrba from which another route recently begun, continues southwestward to Skoplje. Passing the summit at Delian (elev. about 2100') the route descends through a small valley into Dupnitsa where it strikes the Dzhermen River. At Boboshevo the Struma enters from a gorge and the route then follows the Struma River, passing two gorges

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At Kozlodnitsi (south of Gorma Dzhumaia) and at Kresna. The valley then widens and meets the Strumitsa valley to the west. From here there are three possible routes to Salonika. One is west through the Strumitza valley over a mountain trail. (There is no road or railroad through here but it was used by the Germans in their attack on Greece.) The road southward through the Rupel Defile opens two routes. The western Salonika railway line crosses the flat plain of the Struma at the foot of the Belasitsa mountains crossing the water shed to the marshy Lake Deiran basin at Dovo Tepe (elev. 700'). The route then continues southward along the Vardar plain following the River Ballikos to Salonika. The main route which carries the railway to Dedeagach is down the flat Struma plain to Seres. From Seres the route goes eastward through flat marshy terrain turning up the Angitos River and entering the open plain of Drama through the Angites gorge. Beyond Drama the railroad takes the northern route over a mountain (elev. about 600') and descends sharply to Yanthi. The highway goes southwest, follows the coastal plain to Kavalla and turns northeastward to Xanthi. Eastward the road and railroad pass through hilly country descending to Alexandropolis through the Iren valley.

Routes to Coast of Bulgaria

There are two railways from Sofia to the coast. One follows the Sofia-Istanbul route to Plovdiv then turns northeastward to the port of Burgas keeping on the southern side of the Balkans. From Flovidiv the line crosses the flat marshy plain, rising gently and going through rolling country to Stara Zagora and Nova Zagora. It descends to the Tunja valley and continues along the foot of the Chatal Balkan range. It follows the Azmak Dere through a narrow pass rising to cross the Aegean-Black Sea water-shed (elev. 560'). Through the Aitos valley the line reaches the coast and crosses the isthmus between Lake Vayakoi and the sea to reach Burgas port.

The second trunk line leads from Sofia to the port of Varna. From the Sofia basin it goes north cutting through the Stara Planins (Balkan Mountains) through the deep gorge of the Isker River (elev. 1509'). At Cherven Breg the route leaves the Isker valley and climbs to the plateau summit at Humata (elev. 700') descending to the Vit valley and then rising up a tributary valley to Pleven. From Pleven it crosses a series of valleys meeting the Ruschuk-Varna line at Razgrad. From Razgrad it climbs to a plateau (elev. 1350') then turns south-eastward to the Provadia valley which it followsto Yovkovo where it turns along the shore of Devna lake eastwards to Varna.

Along the route there are a series of connections to the Danube River through the deep valleys which the north flowing rivers have out in the high plateau.

From Ruschuk on the Danube there is a route to the Sofia-Istanbul line at Bakovski. This north-south route also meets the Sofia-Varna line at Gerna Crekhovitsa, the Karlove-Zimnitza line at Dabovo, and the Plovdiv-Burgas line at Stara Zagora.

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## Summary

The main routes which will be used are down the Sava valley to Zegreb and Belgrade, down the Morava valley to Nish one route then leading southward to Salonika, the other eastward to Sofia and down the Maritza to Istanbul. The routes to the Bulgarian coast can be used to transport troops to the ports of Burgas and Varna. The routes from the interior to the Dalmatian and Aegean coasts will be of limited use since the terrain is too difficult and few facilities are available.

## B. Terrain in Relation to a Possible Axis Advance into Turkey

Turkey may be considered divisible into three highly generalized topographic regions. Excluding the plains and low hills of European Turkey and several other small areas, these regions are: 1) the coastal plain and the river valleys of the west; 2) the central plateau which covers most of western Turkey and varies in elevation from 3000 feet in the west to 5000 feet in the east; 3) and the mountains which enclose the central plateau on three sides - the north, east and south.

The central plateau, which is the heart of Turkey, has few natural obstacles on its western side. In view of the fact that the Axis has its troop concentrations and points d'appui at such places as Eastern Bulgaria and Greece, Mytilene, Samoa and Dodecanese, it is from the west, primarily, that the drive on Turkey may come.

The Axis drive will probably have two wings. The left may advance overland on European Turkey from Greece and Bulgaria and attempt a landing on the Black Sea coast of Asiatic Turkey somewhere between the Bosporus and Zonguldak. The coast along this stretch offers no serious obstacles to such a landing. The Axis right wing may proceed directly from the Aegean islands to Turkey's west coast and attempt to advance up the Menderes and Gediz Valleys.

The advancing left wing will encounter few natural obstacles until it reaches: a) the Catalca line on the peninsula leading to Istanbul; and b) the peninsula of

Gallipoli. Both are rough, dissected areas which the Turks have fortified to some extent. However, the Turks realize that both areas, especially the Gatalca line, are untenable and they expect to retire across the Bosforus after fighting only a delaying action on the European side.

Although a successful defense might be made by the Turks on the eastern side of the Dardenelles-Marmara-Bosporus line against the left wing, the defending troops would probably be exposed to a flank attack from the right wing so that the Turks would have no choice but retire across the Bursa plain to the western edge of the central plateau along the line Dinar-Afyonkarahisar-Eutahya-Eskigehir.

Such a line, although not tenable over a long period of time would impose fairly serious obstacles on an Axis advance. Because of the height and rather rough terrain along the western end of the plateau the Axis might follow the following routes which afford the easiest access to the central highlands: 1) the Bursa-Bilceik-Eskigehir route; 2) the Cediz valley: and 3) the Menderes valley. The upland heads of these routes are respectively Eskigehir, Afyonkarahisar and Dinar. However, topographic advantages along such a line are not enough to counter-balance Axis superiority in personnel and materiel. Holding actions could be fought at the above named cities until the main body of the Turkish army could consolidate the only position in the country where it can fully utilize topographic obstacles great enough to afford a definite advantage over invading forces. This position is the Karaman-Nigde-Kayseri-Sivae line, which lies at the base of the mountains at the eastern end of the central plateau. (see appendix)

Between the western and eastern side of the central plateau there are no topographic features which would raise serious barriers to an eastward advancing army. The country is rough in many spots but not so rough as to preclude the use of mechanized equipment. Despite this fact there are only two good natural (and actual) routes across the plateau. One is from Afyonkarah~~i~~sar through Kenya to Adara. The other runs from Eskigehir through Ankara to the northeastern section of Anatolia. These routes avoid the rougher uplands and the lowlands, which are likely to be marshy after rains. As a result they are the only two satisfactory all-weather routes across the plateau. The possibility of constructing new roads or improving the seasonal roads, however, is good and such an action might be taken by the Axis. In many cases the only necessary steps would be to give them a rock cover and to dig ditches for better drainage.

Should the Turks decide to fight major delaying actions along either of these routes, Kenya and Ankara or areas a short distance from the two cities would offer suitable spots as far as the terrain is concerned. Ankara itself is located at the base of a range of hills which could be used as a defense point. Some twenty miles east of Ankara the valley of the Kizil Irmak and the hills on its eastern side also could be utilized as a good place to give battle. The route east of Kenya goes through a bottleneck caused by extensive swamps on either side of the road. The bottleneck and the surrounding hills would be suitable for a holding action.

The greatest topographic obstacle to an Axis advance in central Turkey is the northeast trending Taurus mountains. Since they sweep all the way from the Mediterranean to the Black Sea and since Turkish forces fighting along the line approximately Karaman-Niğde-Kayseri-Sivas would have their flanks protected by the east-west trending Taurus mountains to the south and by the heavily forested Pontic range to the north.

The Taurus range is well situated to effectively block any attempted passage from the plateau to either Syria or Iraq or to the Transcaucasus region of Russia.

Summarily, as the Axis forces proceed westward from their continental and island bases to and across Turkey the topographic obstacles which they encounter become increasingly difficult to surmount, but the only serious barrier is the Taurus Mountains. Landings can be made on the Mediterranean shore and the Straits can be crossed - with this in mind the Turks are already reconciled to abandoning Istanbul and Izmir. The routes leading to the plateau are fairly easy ones while the plateau itself offers no serious barriers. Only the Taurus range stands as a real wall between the Axis and the Middle East or Transcaucasia.

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## APPENDIX

### (Topography in Relation to a Possible Axis Advance into Turkey)

The mountains which would form the backbone of the approximate line Karazan-Miğde-Kayseri-Sivas are the Cilician Taurus and their northeastern extensions. Of equal importance, however, are the Pontic range which flanks the central plateau on the north and the Lycian Taurus, and the Pisidian plateau which intervene between the central plateau and the Mediterranean shore. Thus, a rugged mountainous horseshoe, parallels the Black Sea on the north, abuts on the end of the central plateau in the east and curves southward to form a wall which runs along the Mediterranean to the south.

### The Pontic Highlands

These highlands consist of a series of high ranges adn deeply sunken valleys running east to west, parallel to each other and to the coast and rising in steps to the high interior plateau. The rivers, which drain this area, flow in wide, deep east-west troughs and cut northward in narrow, often impassable gorges.

The Pontic Range is suitable protection for the northern flank of the central plateau. Its high relief, dense forest and lack of good north-south routes confine communications between the Black Sea ports and the interior to poor earth tracks. Mechanized transport would meet with serious difficulties and pack transport would probably be essential.

The Taurus Highlands and the Pisidian Plateau are obstacles to invasion owing to their high and complicated relief. They form a vast barrier along the south of Asiatic

Turkey. The whole region, over fifty miles wide, is impassable thanks either to lofty mountain ranges as in the Cilician and Lycian Taurus, or to extensive and rugged plateaus, in which rivers have cut deep inpenetrable gorges. Much of it is unexplored. Its roads are few and in poor condition, and pack transport would be essentia for transit, apart from the two routes noted below.

## Routes from the Mediterranean

Should a movement on Turkey be accompanied by the Axis' taking Cyprus, two routes, other than those across the central plateau, would be open to the invader. One is a rather difficult road north from Antalya. In Axis hands its only function would be to flank Dinar and Afyonkarahisar, both of which are far west of the main defense line.

Axis possession of the Cilician Plain would be far more serious. This would give them access to the Cilician gates the only good route to the interior. Should they be successful in forcing passage along this route they could flank the whole Karaman-Niğde-Kayseri-Sivas line. Fortunately, the route through the Cilician gates is such a restricted and tortuous one that invaders might be held indefinitely.

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3. G. S. I. Wheel Routes, Turkey, etc. September 22, 1941.
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## 2. CLIMATE AND WEATHER CONDITIONS IN THE BALKANS, TURKEY, SYRIA, AND EGYPT.*

In the lands bordering the Aegean and Eastern Mediterranean, December and January are ordinarily the stormiest months, with rain falling on from 10 to 15 days per month, and the sky on the average 50 to 60% covered with cloud. Even in these months, weather conditions are reasonably favorable for sea and air operations on the majority of days, ground operations on about half the days.

### Conditions at Axis bases

The western shore of the Aegean, including Athens and Salonika, has comparatively little rain: less than 2½ inches in December. Eastward, in Thrace, rainfall increases, amounting to 4.80 inches in December at Istanbul. Movement of motor transport on the prevailing dirt roads or across country in the lowlands from Salonika or Bulgaria toward Istanbul is rendered difficult or impossible in wet weather by the mud and the swollen streams. Winter visibility is excellent: better than 2 nautical miles on three out of four days in the morning, 8 out of 9 days by noon; and less than ½ mile on only 2 or 3 days per month. Thin mist, seldom dense enough to be called fog, occurs on about half the mornings, but often clears by noon.

### Conditions along supply routes

The only low-level land route from Germany into the Greek and Bulgarian bases follows the Bulgarian Coast of the Black Sea, and encounters the usual winter difficulties of mud and swollen rivers. The other routes must cross the mountains of Jugoslavia or Bulgaria, and are therefore confronted with eastern Mediterranean, and southwesterly along the Libyan, Egyptian, Syrian coasts. Winds of gale force occur on the average in December two or three times off the Greek mainland, but less than once over the sea.

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*See maps and text in appendix for additional details.

Dangerous icing conditions for airplanes will seldom be encountered below elevations of 5000 feet over the northern Aegean, and 8000 feet over northern Egypt in midwinter. On the whole, therefore, air operations are hindered little by icing conditions at any time of the year.

Conditions in Axis objective areas

The coast of Turkey is considerably wetter than the Aegean coast of Greece, with 4½ to 6 inches of rainfall. Rainfall increases southeastward along the coast, with Beirut (7½ inches in December) one of the wettest places of the entire Mediterranean. Most roads in western Asiatic Turkey and Syria frequently become impassable for wheeled vehicles for days at a time. The Egyptian coast is the driest part of the eastern Mediterranean. The terminus of the Suez Canal receives less than 1 inch of rainfall per month in midwinter, although Alexandria has a moderately rainy period in midwinter (2½ inches in December).

Data for roughness of sea, important for landing operations, are not available for the Turkish coast. For other localities, conditions are as follows:

|  | Number of days per winter (Dec.-Feb.) with calm or slight sea. | Number of days per winter with rough sea. |
|---|---|---|
| Candia | 52 | 23 |
| Beirut | 48 | 16 |
| Haifa | 68 | 8 |
| Port Said | 49 | 11 |
| Alexandria (per 100 days, Dec.) | 86 | 5 |

On the whole, it would appear that sea conditions are most frequently favorable for landing operations in Syria, Palestine, and Egypt and probably along the Southern Turkish coast.

problems of snow. All passes from the north may be blocked by snow occasionally from December to February. Even the lowest route, by way of the Vardar and Morava Valleys, sometimes experiences a two-or three-day blizzard that temporarily stops traffic. At elevations around 1750 feet (Vardar pass, Sofia, Sarajevo), the total winter snowfall amounts to about 1 or 2 feet. At 3000 feet, a fall of 4 or 5 feet of snow is to be expected in winter, and above that height, most of the precipitation from December to February is in the form of snow. Traffic through Bulgaria from the north and northwest cannot be depended upon in winter except on the Sofia railroad. The Axis bases in central Bulgaria and Greece depend, then, upon two main railroads for land-borne supplies.

Aerial activity will be hampered chiefly by bad icing conditions that prevail over the mountains much of the time in winter.

## Conditions on the Sea Routes

The shifting wind squalls that accompany the half dozen storms that occur per month in winter are the principal weather hindrance to sea operations. However, the temporary cloudiness accompanying the storms might be a positive aid in shielding advancing ships from observation. In general ships and airplanes operating from Greece and Bulgaria would have favorable winds for an attack on Anatolia and Syria, unfavorable winds for their return. In the Aegean, winter winds are prevailingly from a northerly direction; off the Turkish coast they are northeasterly; and northwest and north off the Greek coast. Westerly winds prevail in the open sea of the

## 3. HEALTH CONDITIONS

The most important consideration here is the spreading of typhus and other contagious diseases, originating with German troops coming from the Eastern front and in over-crowded refugee camps and poor housing conditions in cities. The danger of epidemics in the Balkans is increased by the dislocation of normal life in Yugoslavia and Greece, especially by the extreme shortage of medical supplies in Greece and the undernourishment of the Greek population. Skin diseases due to lack of soap are also said to be rife. In Bulgaria strenuous quarantine efforts have been taken to forestall the spread of contagious diseases across the frontiers. There will be favorable conditions for typhus during cold weather. Sanitary and heating conditions throughout the Balkans are extremely primitive. Hospital facilities for the most part are inadequate and over-taxed through use by German wounded and convalescents from the Eastern and African fronts. The supply of native medical personnel is not sufficient.

Water in Bulgaria is generally adequate. In southern and southwestern Yugoslavia and Greece conditions are less favorable. Water is not always accessible along the railways and roads.

## 4. TRANSPORTATION

Balkan railways would play a vital part in Axis military operations against Turkey or against North Africa from bases in Greece. The railway lines crossing northwestern Yugoslavia from east to west would also be important for the movement of troops to North Africa via Italy. In general the capacity of Balkan railways decreases in a southerly direction.

The volume of rail traffic that can be delivered to the Aegean is limited to 8,500 to 10,000 tons daily by the capacity of the Skoplje-Veles section of the Belgrade-Nish-Salonika line and the Krupnik-Demir Hisar section of the Sofia-Radomir-Salonika line. The Skoplje-Veles line is single-track standard gauge, with an estimated military capacity of 24 40-car trains daily in each direction. According to a British estimate the trains would average 300-350 tons of military stores. The Krupnik-Demir Hisar section of the Sofia-Salonika line is still operating as narrow gauge, with a capacity of only 10 trains of 150 tons each daily. Its conversion to standard gauge may be completed at any time, which would raise its capacity to about 18 trains of 300-350 tons daily in each direction. This would increase the total military deliveries at Salonika to from 12,500 to 14,500 tons per day.

The line from Svilengrad to Dedeagach along the Turkish frontier cannot be considered strategically safe from the Axis point of view, hence its capacity is not here included, although it is estimated to have a capacity of up to 20 trains daily. It would be important in the secondary stages of a successful Axis campaign.

Rail traffic to the ports of peninsular Greece is limited to the single-track Salonika-Athens line which has a military capacity of up to 20 trains daily. Assuming 300-350 tons of military stores per train, this would permit the delivery of only 6,000-8,400 tons daily to Greek ports south of Salonika. Use of local lignite instead of imported anthracite has slowed down traffic on this line and only 7 to 10 trains a day have been reaching Athens. The rolling stock shortage is severe.

South of Athens all traffic is narrow gauge and deliveries to all Peloponnesian ports are limited by the capacity of the Corinth canal bridge in one direction, which is up to 20 trains with about 2,500 tons of military stores a day.

For land operations against Turkey four rail-heads within 25 miles of the frontier are available: Dedeagach, Momchilgrad, Zlati-Dol, and Elkhovo. It is estimated that 20 trains of 40-cars each can reach Dedeagach from the Salonika region. Fifteen trains of 33 cars each can reach the Momchilgrad rail-head daily either from the Sofia-Plovdiv-Svilengrad main line or from the north. A total of 30 trains of 45 cars each should reach the Zlati-Dol railhead daily, 18 trains over the Sofia-Plovdiv-Svilengrad main line and 12 from the north (Nova Zagora). It is estimated that 12 trains of 35 cars each can reach Elkhovo daily from the north. Assuming an average military load per train of 300-350 tons, this results in a total of approximately 23,000-27,000 tons daily.

For the transfer of troops and equipment from the Eastern front to either the rail-heads in Thrace or to Greece, the crossings of the Danube are a limiting factor. There is only one railway bridge between Rumania and Bulgaria, that at Cerna Voda on the Bucharest-Constantza line, which joins the

Oborishte-Varna line at Medgidia. This bridge has a capacity of only 12 to 15 pairs of trains per day. Between Ruse and Giurgiu there is a rail ferry with a one-way capacity of 150 20-ton cars per 24 hours--approximately three trains, or 900-1,000 tons of military stores. Trans-shipment can also be effected by boat at this point and also between Svishtov and Zimnicea, Nikopol and Turnu Magurele, Vidin and Calafat, and Reni and Tulcea. The amount which can be transhipped between these points depends on the amount of river shipping and labor assigned. In any case operations will be reduced if not stopped during the winter. The Danube is frozen an average of 12 days a year.

In Yugoslavia there are three bridges across the Danube: At Belgrade, Novi Sad, and Bogojevo. However, traffic from the Eastern front routed via these bridges would be funnelled onto the Belgrade-Nish-Salonika line.

In the event of an Axis attack on North Africa from bases in southern Italy, the railway lines of northern Yugoslavia would be of vital importance in the movement of troops and supplies both from Germany and from the east. The double-track railway via Maribor, Zidani Most and Ljubljana with a capacity of 48 pairs of trains daily, is one of the two main lines between Vienna and Triests. It has connections with the main Belgrade-Vinkovei-Zagreb line, branching at Zagreb to Sushak and to Ljubljana, which would be vital in bringing troops from S. Russia to Adriatic ports. The railways leading to Sushak-Fiume and Split would also be of significance in connection with the movement of troops by ship in the Adriatic--either to south Italian bases or direct to north

Africa. Of lesser importance in this connection is the narrow gauge line from Belgrade and Brod, through Sarajevo to Dubrovnik and Kotor Bay with a normal daily capacity of 10-15 trains each way carrying up to 150 tons of military stores each.

The figures of capacity given here do not take into consideration the effect of guerrilla activities and sabotage, which are particularly strong in this area. Although all the main lines are heavily guarded by the occupying forces, traffic is constantly subject to interruption, often for two or three days at a time. These interruptions are likely to increase as a result of the Allied occupation of North Africa.

In general it can be said that steep grades (up to 25 per cent), poor road beds, sharp curves (Minimum 2000m.) and short station areas make military traffic difficult. Vital junctions such as Sofia proved themselves inadequate in handling traffic during the German attack on Greece in 1941.

The highway situation is also unsatisfactory from the Axis point of view. Even the best through highways south of Belgrade and Bucharest, with the exception of the international highway Budapest-Belgrade-Nish-Sofia-Adrianople, are only second rate macadam, in particularly bad condition during the winter months.

Trunk highways to Turkey and Greece are Belgrade-Skoplje-Salonika-Athens, Belgrade-Nish-Sofia-Corna Dzhumaia-Salonika, Vidin(Lom)-Ferdinand-Sofia-Plovdiv-Svilengrad, Russ-Turnovo-Kazanluk-Stara Zagora-Svilengrad, and Salonika-Seres-Drama-Giumiurdzhina-Dedeagach. These roads have been maintained by military authorities and have relatively good macadam surfaces. They average 26 ft. in width (paved portion 18 ft.)

and have maximum gradients of 1:16. Bridges on these roads average 18 ft. between parapets.

To supplement the railways near the Turkish frontier highways south from Burgas and Elkhovo, and east from Haskovo, Momchilgrad and Giumiurdzhina would be used. These average 24 feet in width (paved portion and bridges 14.5 ft.) and are generally in fair condition because of their military value. German engineers have been widening dirt roads near the Turkish frontier to 16.4 ft. and strengthening all bridges to stand a stress of 10 tons per sq. yard. Similar work has been going on elsewhere in the Balkans, especially in W. Yugoslavia and southern Bulgaria where there are few railroads and war or guerrilla damage has been great.

## 5. VITAL AREAS

### (Vital points affecting traffic from Russia and Germany toward North Africa and Turkey)

Railway Junctions. Railway junctions for both north-south and east-west rail traffic in Yugoslavia are Jesenice, Zidana Most, Vinkovei, Belgrade and Nish. In Rumania the vital junctions are Bucharest, Ploeshti, Pashcani, Maresheshti, Buzau and Timishoara. Bulgarian junctions are Sofia, Plovdiv and Gorna Orekhovitsa. In Greece, the Salonika and Athens-Piraeus junction areas across are vital to the standard-gauge lines, and Corinth and Zevgolatio are important on the narrow-gauge network which circles the Peloponnesus. The most important single stretch of railway in the Balkans is the double-track Velika Plana-Lapovo section of the Belgrade-Nish line.

Bridges. Vital Yugoslav bridges are the Borovnica viaduct near Ljubljana, the three bridges at the Zidani Most junction, the Sava River bridges at Zabreb and Belgrade, the Panchevo bridge over the Danube at Belgrade, the Chuprija and Cerovac bridges over the Morava near Nish, and the more than 10 bridges over the Vardar between Skoplje and Gevgeli. In Rumania destruction of the Dniester river bridge at Tighina, the Pruth river bridge at Chernautzi, the Prahovo river bridge between Ploeshti and Bucharest, and the Cerna Voda Danube bridge would be serious.

Bulgaria has vulnerable bridges at Pobit Kamuk, southeast of Sofia, and over the Maritsa at Plovdiv, Rakovski and Simeonovgrad. Important Greek bridges are the Vardar crossing north and west of Salonika, the Papadia and other viaducts between Athens and Salonika, and the Corinth canal bridge.

Other Vital Points. The oil refineries at Ploeshti and the oil and shipping facilities at Giurgiu and Constanza ports also are points affecting large-scale military movements through Rumania both by land and sea. In Yugoslavia such points are the Belgrade station areas, the Sushak and Split port areas, and the Danube ship channel at the Iron Gates. In Bulgaria, damage to the Pernik coal mines (which supply almost all the railway fuel), to the rail ferry installations at Ruse, and to port facilities in Varna and Burgas would help cripple traffic. In Greece, the port facilities at Salonika, Piraeus, Nauplia and Patras, the Corinth canal and installations on Crete and other Greek islands are vital.

In addition to these few vital points of decisive importance, there are many lesser ones which, if disrupted, would seriously interfere with large-scale Axis movements.

## 6. PORTS AND NAVAL BASES

The indented coast of the Balkan Peninsula has a very large number of ports and harbors. However, only a few of these have landward connections or port facilities capable of handling large military units or significant volume of supplies and equipment. Some of these major ports would be primarily of importance for military movements in conjunction with a main attack across the Mediterranean based on Italy and Sicily; others would be of greater importance for an attack on Turkey or Syria. For such an offensive, numerous small ports capable of handling only small vessels could be used, since only very short over-water distances would be involved. The ports of southern Greece could be used either for an attack on Turkey or across the Mediterranean. Finally, certain ports might be used for coastwise movements to other ports supplementing the overland routes to these latter.

The four major ports of Yugoslavia are Sushak, Shibenik, Split and Dubrovnik. These Adriatic ports could be used in connection with Axis offensives across the Mediterranean launched from either Greece or Italy. As compared with ports in Greece or southern Italy, they are relatively safe from air attack. However, the rail connections of three of these ports--Shibenik, Split and Dubrovnik--to the interior are subject to so much interruption due to guerrilla and Chetnik activities that it is unlikely that the ports can be used to anywhere near their maximum capacities.

Sushak, the most northerly of the Yugoslav ports and geographically a part of Fiums, is the only port with reasonably secure rail connections, both to the north and to the east. The port facilities are good; the length of quayage totals

4,200 ft. with depths of 23-33 ft. alongside. There are 11 electric cranes. Applying the rough rule of thumb of one ton of cargo loading capacity per foot of quayage, the capacity of the port may be estimated at approximately 4,200 tons daily. In 1938 the port handled 600,900 tons--a daily rate of about 2,000 (on the basis of 300 working days).

*Shibenik* is not so well-equipped. Its 2,400 ft. of quayage should give it a capacity of roughly 2,400 tons daily. In 1938 it handled 247,240 tons of export and import cargo--a daily rate of about 825 tons.

*Split* was Yugoslavia's leading port before the war, the traffic through it almost equalling that of all the other ports together. Before the war it had 3,752 ft. of quayage with more than 14 ft. of water alongside and 13 electric cranes. On the basis of one ton per foot of quayage, the port should have a daily capacity of 3,750 tons. In 1938 the imports and exports through the port totalled 686,507 tons--a daily rate of approximately 2,300 tons.

*Dubrovnik* (Gruz) is of limited importance since its rail connection with the interior is narrow-gauge. With 2,750 ft. of quayage with 20-22 ft. of water alongside, the port should have a daily capacity of about 2,750 tons. In 1938 the port handled 47,218 tons--a daily rate of approximately 1,590 tons.

Of the hundreds of ports and harbors in *Greece* only four--Piraeus, Salonika, Patras and Volo--are of major importance.

*Piraeus* is probably the principal port from which an Axis offensive based on the Balkan Peninsula and directed across the Mediterranean would be based. The Port of Athens and principal port of Greece, it is modern and well equipped. Its 3 harbors have approximately 7,500 ft. of quayage, which should give it a capacity of 7,500 tons daily. With loading from lighters it would be considerably more than this figure.

Salonika would be important in an Axis attack on Turkey and in the movement of supplies to southern Greece in the event of an attack across the Mediterranean. Its 3,575 ft. of berthing quays give it a daily capacity of roughly 3,600 tons--probably somewhat more. In 1938 the port handled 968,500 tons--a daily rate (300 working days per annum) of approximately 3,225 tons.

Patras is the principal port of the Peloponnesus and would presumably be of importance for embarking Axis forces in any offensive directed across the Mediterranean. No data are available as to length of piers; hence no estimate of capacity is possible. In 1938 the port handled 236,200 tons--a daily rate of nearly 800 tons. Its railway connections are narrow gauge.

Volo on the Gulf of the same name would probably be of some importance in an Axis attack on Turkey. There are 2,130 ft. of quayage, suggesting a daily capacity of about 2,100 tons. The chief drawback of the port is its inferior rail connection: it is connected with the main line Salonika-Athens by a one-meter gauge branch line, necessitating transshipment at Larissa, the junction with the main line.

Of the smaller ports Aghia Marina, Eion (Amphipolis), Kavalla, Elefsis, Kalamata, and Nafplion are likely to be used. At Aghia Marina new jetties with railway connections and cranes have been reported as under construction by the Germans; a new branch line connects the port with the Athens-Salonika railway.

Eion (Amphipolis) at the mouth of the Struma is also being developed--a branch line has been built to the Serres-Drama railway.

In the event of an attack directed against Turkey, the principal Balkan Black Sea ports involved would be Constantza in Rumania and Varna and Burgas in Bulgaria. It is conceivable that some of the Danube ports--Tulcha, Ismail, Reni, Braila and Galatz--might be used in case a major movement were planned through the Black Sea and to relieve congestion of traffic passing through Bulgaria, but by the end of December there would be likelihood of freezing. The Germans have been developing Tsarevo (Vasiliko), south of Burgas, as a naval base, but as there are no rail connections, it is doubtful if much use would be made of it.

Varna has 3,107 ft. of quay space with room for about 10 ships of 600 to 8,000 tons. The daily freight loading capacity is about 3,000 tons. Depth alongside is 26.2 ft.

Cranes include two floating cranes with a total lifting capacity of 56 tons, 3 portal cranes with 10-ton lifting capacity each, and several hand and railway winches. Increased loading space of unknown capacity is located at the Varna naval base and along the Devna lake ship canal.

The Germans have been using Varna as a naval base and for assembling submarines and constructing landing and transport barges. Goods traffic has been limited. Rail connections with inland Bulgaria and Rumania are good, the Sofia-Varna line having a capacity of 16 to 18 trains each way per day.

Burgas, with a quay frontage of 2,156 ft., has space for 5 or 6 medium ships. The depth at the quay is 24.6 ft., and the daily freight loading capacity is about 2,200 tons.

Lifting equipment includes one 10-ton mobile crane and at least 6 2-ton winches.

A cove, 10 m. S.E. of Burgas has been fitted out as a naval base and may provide additional loading space.

Burgas has been used extensively for caique traffic between Turkey and Bulgaria. The port is reported congested with German goods. Rail connections are good and from 12 to 16 trains can enter and leave the city each day.

Small ships could be loaded with from 500 to 800 tons a day in the ports of Tsarevo, near the Turkish frontier, and at Sozopol. Both are without rail connections.

Constantza is Rumania's sole port during the months in which the Danube is frozen. The facilities are very good but are to a large extent specially designed to handle oil and grain. For general cargo the estimated daily capacity is 7,200 tons (18 ships discharging 400 tons each). This does not include the oil basins, where the pumps have a capacity of 2,450 tons per hour (58,800 tons per 24-hour day). The grain quayage totals 9,031 ft. There are at least 10 cranes including one of 40-ton capacity (semi-mobile railway Titan), 7 other electric cranes of 3-ton capacity and one floating crane of 15 tons capacity.

The railway from Cerna Voda has an estimated capacity--east-bound--of 2,000 cars a day.

CLASSIFICATION Changed to UNCLASSIFIED

## 7. AIR BASES

Airfields in Yugoslavia were relatively well developed before the war and have been expanded by the Axis. The principal airdromes in the north, northwest, and northeast are at Ljubljana, Zabreb, Csijek, Maribor, Petrovgrad, Vukovar, Novi Sad, Zemun (Belgrade), Panchevo, Vrshac and Bela Crkva. Along the Adriatic coast there are airdromes at Sushak, Gruda (Dubrovaik), Mostar, and Podgorica; there are seaplane bases at Sushak, Split, Dubrovnik, Kotor, Vodice, and Zemun (on the Danube). In the central part airfields are located at Banja Luka, Sarajevo, Nish, and Kraljevo, and in the south at Skoplje and Prilep. All these have hangars and, in most cases, repair facilities. Auxiliary landing fields are scattered throughout the country.

The Yugoslav airfields have chiefly served the Axis as bases for attacks on guerrilla positions and for refuelling and servicing aircraft en route to the Mediterranean zone.

The principal airfields of Rumania, with hangars and repair shops, are in the vicinity of Bucharest (about 6), Cernautzi, Constantza, Brashev, Arad, and Timishoara (Temesvar). Others are at Jasay, Tecuci, Ploeshti and Sibiu. Auxiliary landing fields are located along the pre-war commercial air routes at intervals of 50 km.

The principal German military airdrome is at Zilistea, 12-15 km. north of Buzau.

Most of the airdromes and landing fields in Bulgaria have been constructed since the beginning of the war and are operated by the Germans. The chief airdromes are located around Sofia, Plovdiv, Karlovo, Stara Zagora, Kazanluk, Pleven, Levech, and Gorna Orekhovitsa. The main bomber bases are in the center of the country. Smaller airdromes and landing fields have been constructed along the old south boundary and in the southeast, at some distance from the Turkish frontier. There are seaplane bases as well as airdromes at Varna and Burgas. Altogether there are at least 60 existing airdromes and landing fields, as well as those under construction or projected; there are also emergency landing fields.

Almost without exception the surfaces are grass or dirt. Most of the airdromes are all-weather, but they are likely to be affected by snow, thaw, and heavy rain. They are equipped with hangars, minor repair facilities and fuel storage, in some cases underground. Only a few are equipped for night flying or have A.A. defenses. All the important airdromes are less than 300 km. from Adrianople. A few have hard surface runways.

In Greece there are at least 28 fully-equipped airfields, 47 emergency landing fields, 27 fully equipped seaplane bases, and 11 seaplane anchorages. The above are scattered over the country, with the exception of the central mountain mass. The most important are grouped around Salonika, Athens, in northwestern Pelopennesus, and on Crete. In the event of operations directed either towards North Africa or Turkey, all four of these areas would be used.

It has been estimated that Greek airfields and seaplane bases could accommodate about 1,700 planes of all types, assuming 50 per cent are pursuit type. The capacity of the 28 airdromes has been estimated at about 800. As pursuit planes are diverted to landing fields, more bombers and transports could be accommodated. As only a small per cent of the planes engaged in ferrying would be using the airfields at any one time, it is assumed that the airfields are capable of accommodating 1,000 planes simultaneously.

## 8. LOCAL SUPPLIES

In the Balkans all the staple food crops are government monopolies and all but the barest subsistence minimums are stored by the authorities for shipment to Germany and for feeding the city population. Such stores would probably be drawn on for supplying Axis troops. In addition, all consumer goods and raw material supplies are registered with the governments and could be made available to the Germans at short notice. Thirdly, there are reports that Germans have been building up food and armament supplies at strategic points.

In the fertile regions of northern and northwestern Yugoslavia, food is probably adequate, with a small surplus available for Axis use. Macedonia is barely self-sufficient. Except in the larger cities such as Split, food is scarce along the Adriatic coast.

Although gasoline storage facilities exist in most of the larger cities, they were inadequate before the German invasion. Water supplies are plentiful, but, except in cities, water systems are lacking. Fuel is probably sufficient, based on native coal mines and forests.

Due to war-time conditions and poor harvests, the food situation in Rumania is considerably worse than normal. There has been little available for export to Germany, with the exception of corn and perhaps some wheat. Vegetables, vegetable oils and fish would be on hand. The main oil outlets would be Giurgiu (terminus of a pipeline to Ruse) and Constantza. Oil supplies for the African front have also been transported to other Bulgarian Danube ports with rail connections. There has been a shortage of fuel, especially in large cities.

The main supply of food for Axis forces would be from Bulgaria, where the normal excess has been increased by strict rationing, improved agricultural methods and harvest controls. Although the harvests have not been good, there were about 400,000 tons of wheat available for the Germans this year, as well as 200,000 tons of other grains, 35,000 tons of beans, 75,000 tons of oil seed, 150,000 tons of fruit and vegetable preserves, and over 20,000 tons of meat and fats. The needs of the Bulgarian army and the tendency toward economic sabotage among the rural population would be increased in the event of hostilities with Turkey. The Germans are reported to have been accumulating stocks within the country which would be available for use either in North Africa or in Turkey. There is no local oil. Supplies come from Rumania via Giurgiu-Ruse or by ship to Varna, where there are considerable storage facilities. Other fuel, including lignite, wood, and charcoal, is plentiful, but its distribution has been seriously affected by the shortage of transportation.

The food situation in Greece during the coming winter may be even worse than during the last, particularly in the cities, in spite of efforts to increase domestic production and the small relief supplies. There even are reports that the Germans have been diverting these food supplies to a storage base a few miles south of Athens (Lavrion). However, the Germans will have to bring from the outside the bulk of their food, fuel and other supplies. They have been reported as replenishing fuel dumps at Piraeus and Salonika.

## 9. POPULATION

Allied successes in North Africa and Russia's stand at Stalingrad have combined to stiffen the resistance of Balkan peoples and have made warfare and sabotage by guerrilla fighters in Yugoslavia, and to a certain extent Greece, one of the most serious potential obstacles to large-scale Axis troop movements in the Balkans.

At present 33 Axis divisions (about 300,000 troops), in addition to about 50,000 men of the Serb and Croat puppet regimes are required to police Yugoslavia, and 15 divisions (about 150,000 men) to control Greece. Axis forces include about 32 Italian, 9 Bulgarian and 7 German divisions, most of which are deployed along transportation routes or are fighting guerrillas.

The organized guerrilla fighters in Yugoslavia number at present between 73,000 and 100,000. They are divided along political lines into two groups: the followers of General Mihailovich, recognized as the official army of the Yugoslav government-in-exile, and bands of so-called "partisans" who look toward Soviet Russia for support in the post-war solution of Yugoslav problems. In addition, there are numerous small independent bands.

The Mihailovich forces are concentrated largely in E. Bosnia and Hercegovina, while the partisans operate in Slovenia, S. W. Crotia and W. Bosnia. Despite ideological differences, the two groups would cooperate in an attack on Axis occupation forces and in wrecking the transportation network, if given adequate allied support. It should be noted that Americans and Russians are trusted more than the British.

Mihailovich's forces have been holding back, waiting for a favorable moment to strike, such as an Axis attack through Turkey. Renewal of war in the Balkans would vastly increase the number of insurgents, and bands would spring up in areas now controlled by Axis forces.

Numerically the Greek guerrilla forces are smaller, but though they too are split by ideological differences, their potential strength is considerable.

Practically all of the population in the entire area of Yugoslavia is hostile to the enemy, and attacks on the railways occur daily. The railways north of the Sava River have not been disrupted as frequently as those in the rougher terrain south of Belgrade, Zagreb and Ljubljana.

The approximately 1,700,000 Yugoslav Moslems would probably not change their attitude appreciably in event of an attack on Turkey.

The Bulgarians have steadfastly refused to become involved in actual warfare, other than that required in controlling the Greek and Yugoslav areas assigned to them. They are probably hardly more eager to be involved in actual fighting with the Turks than the Turks are eager to be involved in the war. There have been rumors of revolt among Bulgarian troops at Dedeagach at the prospect of being sent to North Africa. It is conceivable that the United Nations' successes in North Africa, particularly the advent of American forces, may encourage the incipient discontent and sabotage and strengthen pro-Russian and anti-Axis feeling. The 800,000 Moslems, 600,000 of whom are Turks, in old Bulgaria would probably remain passive in spite of an attack on Turkey.

The Rumanian majority may be expected to remain passive. The Rumanians would have no cause to support a movement against Turkey. On the other hand, friction between Rumanians and Hungarians over northern Transylvania might arise or be induced, which would interfere with Axis movements through Rumania. The long-established German and Hungarian communities would cooperate with the German authorities.

Although the Greek people as a whole are too weak to put up effective resistance to the Axis forces unaided, passive resistance and indirect sabotage in the form of strikes have been taking place. Guerrillas in Crete, in the mountain areas of Greece and in the Rhodope mountains under Bulgarian occupation are increasingly active and even cooperating with Yugoslav guerrillas, but as yet do not represent an important factor. Starvation is the major consideration and might lead to despair and even passive cooperation with the Axis.

It is more than likely that large-scale Axis troop movements through Greece would intensify sabotage of railway lines.

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## SECTION E.

### Axis Capabilities for Movement
### Through Tunisia and Tripolitania.
### (with Tunisia under Axis control)

Note: Terrain and climate in Tunisia and Tripolitania are considered in Section C.

## GENERAL ESTIMATE

Assuming adequate Axis potential in troops, ships, airplanes, and supplies, Axis action in Tunisia and Tripolitania against the Allied forces in Cyrenaica and Algeria would be limited in effectiveness above all by the low capacity of the strategically important ports and possibly by the limited number and lack of equipment of the existing air bases in northern Tunisia.

For carrying on a successful campaign the Axis would have to import besides military equipment:

1. Practically all of the petroleum products for trucks, tanks, and airplanes.
2. Most of the coal for locomotives and power stations.
3. Most of the food for the army.
4. Practically all motor transport.

It is improbable that the Axis could land sufficient supplies to support the required force for any length of time at operational level, especially in Tunisia where no stores have been accumulated. The total capacity of the Tunisian and Tripolitanian ports under optimum shipping and weather conditions and free from air attack is 15,600 tons per day. It is doubtful that this capacity could be reached. Moreover, the ports are spread along a coastline of over 700 miles and the two groups of ports nearest the critical theatres in Tripolitania and northern Tunisia have a capacity of only 4,150 and 6,300 tons per day respectively. Unless augmented by other landing methods the limited capacity of the ports would probably impede a major effort. On the other hand the use of beaches would create additional serious problems of lighterage and land transport.

These factors limiting water-borne traffic might be partially overcome by the use of air transport.

Airfields constitute a serious limiting factor only in northern Tunisia, but in the entire area the lack of fuel, ground personnel, and repair facilities would create problems of transport, which would limit the usefulness of all fields. The local shortages would present an especially serious limiting factor since air power will probably constitute the Axis' major weapon and at the same time an essential auxiliary supply line.

South of a line westwards from Sousse the many flat stretches of country and the lack of rain make possible the establishment of numerous emergency air fields in central and southern Tunisia and northern Tripolitania. In the critical area of northern Tunisia, where much of the air force would have to be concentrated for defense, the normal (and emergency) capacity of the existing fields has been estimated at 76 (and 180) medium bombers, 70 (and 130) light bombers, and 74 (and 170) pursuit planes. The emergency capacity could probably not be reached during the winter months because of wet grounds and the vulnerability of concentrated aircraft. The weather would also be a limiting factor in using the cleared spaces in the numerous small plains of northern Tunisia as emergency airfields. Consequently the Axis would have to hold for an effective air defense of northern Tunisia the airfields of central and southern Tunisia. However, this region, also well suited for new emergency fields, is most vulnerable to land attack from Algeria and considerable force would be needed to defend it adequately.

Once established the Axis would encounter few factors aiding its campaign.

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## 1. TERRAIN

See Section C, Part 1-D.

6-5

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## 2. CLIMATE AND WEATHER

See Section C, Part 2

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## 8. LOCAL SUPPLIES

Neither Tunisia nor Tripolitania offers many resources to an occupying force. Tripolitania has always had to import most of its food and all of its fuel, but some stocks accumulated for the previous Libyan campaign should be available. Tunisia on the other hand lacks reserves of all kinds. Most of the surplus wheat crop has been exported to France and Libya. Phylloxera has destroyed many of the vineyards. Meat supplies, however, have been reported adequate, but refrigeration facilities are very limited. Even more important is the critical shortage of petroleum products and coal which has paralyzed Tunisian transport for nearly two years.

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## 4. COMMUNICATIONS

Though adequate for peace time needs, the transport facilities will probably prove insufficient for purposes of heavy military supply. In Tripolitania the entire supply will have to be carried over the one coastal highway, which, though very good, would limit the scope of operations. Roads branching off from it eventually break down into tracks not fit for heavy transport. The railroads are of limited length and could be used only as auxiliary feeder lines.

Tunisia possesses an excellent road system around Tunis, but only one good road connects the capital with southern Tunisia. Towards Algeria three roads branch out from Tunis and increase the flexibility and capacity of transport, but the terrain makes communications between the roads difficult. The efficiency of the railroad system is reduced greatly by the difference in gauges between the lines north (standard gauge) and south (1.00 meter gauge) of Tunis. The only contact in Tunisia between the two gauges is at Tunis, which constituted such a serious bottleneck even in peace time that it was felt necessary to construct the Haidra-Kasserine line connecting southern Tunisia with the Algerian 1.00 meter gauge. The present shortage of fuel would seriously reduce the railroad capacity estimated at two trains a day each way carrying 300 tons each over each of the main lines of the system, and at six to seven trains by concentrating the available rolling stock on one line.

## 5. VITAL AREAS

In Tunisia the region between Bizerte and Tunis, and in Libya the coast to the east and west of Tripoli contain the military, administrative, and economic nerve centers of their respective countries. These vital areas located in a very limited region and in crowded towns are extremely vulnerable to air attack.

The Tripoli area is well protected against land attack by long desert stretches with strong defences, covering the all-important route at El Agheila (467 miles from Tripoli) and near the Tunisian frontier (100 miles from Tripoli).

The northern Tunisian area is much more vulnerable. Tunis is the road and rail center upon which practically all the roads of northern and central Tunisia converge. To defend it adequately against an attack from Algeria would necessitate a considerable force to cover the three routes near the coast: (1) through Tabarca, (2) down the Medjerda valley through Souk el Arba, and (3) from Souk-Ahras through Le-Kef. Another force would be necessary to cover the southern flank which is exposed to the gap lying to the west of the Cap Bon peninsula.

## 3. HEALTH CONDITIONS

Health factors present no special obstacles. Normal military precautions and importation of practically all hospitalization requirements are essential. Local hospitals, at present short on equipment and pharmaceuticals offer about 2,000 civilian beds in Tunisia and about 1,200 civilian beds in Tripolitania.

War conditions might lead to the resurgence of the typhus epidemic which existed in Tunisia in the winter of 1941 to 1942. Malaria might prove a serious threat in northern Tunisia and the coastal region of Tripolitania.

## 9. POPULATION

The Axis could expect little active support from the local population, especially if Italian troops are included among the Axis forces. Italians are held in contempt by most of the native population of both Tunisia and Tripolitania, except for a few tribes in Libya whom the Italians protected against the raids of their nomadic neighbors. As for the Germans neither natives nor Frenchmen would willingly sacrifice their lives for them. This passive attitude could be changed, but only to a limited extent, by a notable Axis victory. At best only a small labor force might be recruited from among the 100,000 Italians in Tunisia and the 70,000 in Tripolitania. Native labor in the cities would probably be forced to cooperate with the Axis; but in the long run their contribution to the Axis effort will be proportional to the degree of Axis success.

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## 6. PORTS AND NAVAL BASES

In calculating the capacity of the relevant North African ports the following optimum conditions have been assumed:

1. Fair weather.
2. No military interference by the United Nations.
3. Sufficient lighterage to saturate the port unloading-, storage-, and clearance facilities.
4. Sufficient railroad and motor transport to clear the cargo disembarked to dumps and operations areas.
5. An ample labor supply.

Since there is questionable justification for the first four assumptions, the capacities listed may be considered favorable to the Axis.

### A. Ports of Tripolitania--east to west.

| | Daily Capacity in Deadweight Metric Tons |
|---|---|
| Sirte | 250 |
| Buerat-el-Hsun | 400 |
| Misurata | 400 |
| Homs | 250 |
| Tripoli | 2,500 |
| Zuara | 350 |

Sirte lies 360 miles east of Zuara and 386 miles from the Tunisian frontier. With the exception of Tripoli all of these Tripolitanian ports are lighter ports. The rough weather conditions of the winter season can be expected to have some adverse influence upon their operations. Tripoli alone is almost unaffected by weather, but since the greatest part of cargo unloaded there must pass through a narrow bottle neck between the main quays and the city, clearance is a major problem. The given capacity of 2,500 tons daily assumes four ships (4,000-8,000 tons gross) at berths and three served by lighters. (Note: generally lighters are not used at Tripoli).

B. Ports of eastern Tunisia--south to north.

| | Capacity (Daily) in Deadweight Metric Tons |
|---|---|
| Gabès | 250 |
| Sfax | 2,300 |
| Mahdia | 500 |
| Monastir | 150 |
| Sousse | 2,300 |

Gabès is some 110 miles from the Libyan border and about 175 miles from Sousse. For Sfax and Sousse the capacity figures assume in each case three vessels at the commercial quays, two vessels at the phosphate quays, and one served by lighter. (Note: the phosphate quays do not normally handle regular cargo). Of the three minor ports Gabès and Mahdia are served by rail.

C. Ports of Northern Tunisia--east to west.

| | Daily Capacity in Deadweight Metric Tons |
|---|---|
| Tunis-La Goulette | 2,500 |
| Bizerte | 3,800 |
| Tabarka | 150 |

For the combined ports of Tunis and La-Goulette, the capacity estimate assumes four vessels at berths and three served by lighters. Operation of these ports at this capacity is entirely dependent upon use of an entrance channel to La Goulette and a very narrow, six-mile channel from La Goulette to Tunis.

The estimate for Bizerte assumes use of five berths at Bizerte, four in the naval dockyards at Sidi Abdallah and one vessel served by lighters. Operation at this capacity is entirely dependent upon: (1) use of the narrow channel through Bizerte and to Sidi Abdallah, (2) rapid adaptation of the naval installations at Sidi Abdallah to a heavy transshipment traffic, and (3) improvisation of better clearance performance than was achieved from Bizerte in peace time.

In view of the limited capacity of the foregoing ports (and assuming no United Nations interference with their use) the Axis will still probably be obliged to unload on the eastern Tunisian beaches which run almost continuously from Cap Bon to the Libyan frontier. Such a procedure would involve a considerable problem in use of small craft, invasion barges, and lighters. There would be a further difficulty in traversing the terrain of marshes and lagoons which often lie immediately behind the beaches.

## 7. AIR BASES

See General Estimate above.

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## SECTION F.

### Axis Capabilities
### For Movement through Turkey.

Note: Terrain and climate in Turkey are considered in Section D.

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## TURKEY

## GENERAL ESTIMATE

Turkey might be attacked by the Axis to obtain one or more of several objectives:

1) A supply route and base for attack on and through Syria and Iraq, by land from Istanbul and/or Izmir.

2) Air bases for the invasion of Syria.

3) Chrome ore. The richest, although not the largest, deposits are in the Kütahya (NW) region, within the second zone of conquest -- next after Turkey-in-Europe, and outside of Turkey's main defense line.

4) A base of operations against Batum.

5) Control of the Straits, hence the Black Sea for the transport of oil to Balkan-Danube ports.

Deterring factors, in addition to the certainty that the Turks will fight any invader, making all gains costly, include:

1) Considering probabilities of sabotage, only a few divisions could be supplied via this route.

2) Air bases along the southern coast are inadequate in number and facilities.

3) It is cheaper and surer to buy the chrome under the Clodius Agreement.

4) The slight advantage of attack from the south would not be worth the opposition of the whole Turkish army.

5) This would justify Turkish antagonism only if sufficient Axis ships can be made available and gotten to the Black Sea, and if the conquest of Turkey were complete enough to insure the delivery of chrome.

Germany must weigh heavy costs against the possible (but not probable?) gains to result from making Turkey a belligerent, and possibly also an additional base of Allied operations against the Axis.

# TURKEY

## I. TERRAIN

The surface of Turkey may be classified roughly in three categories: coastal lowland (up to 200 meters altitude), steppe (200-1000 meters) and mountains (above 1000 meters, many towns existing above this altitude).

Most of Turkey-in-Europe is wide open to mechanized warfare, and attack southward from Marmara and eastward from the Aegean is relatively easy.

The central steppe is almost surrounded by mountain ranges cut by passes which are difficult but only a partial help to defenders. The steep mountains along the Black Sea parallel the coast, which is thus almost without harbors. The Gâvur range in eastern Hatay and the Taurus range north of the Mediterranean coast both present greater obstacles to invasion than anything on the direct routes from the Balkans and the Aegean islands.

The mountains in the east resemble the Caucasus in difficulty of transit and inhospitality of winter climate, because of their ruggedness and altitude.

Due to its large size, the following document has been filmed in segments. The order of the segments is as follows: left to right, top to bottom.

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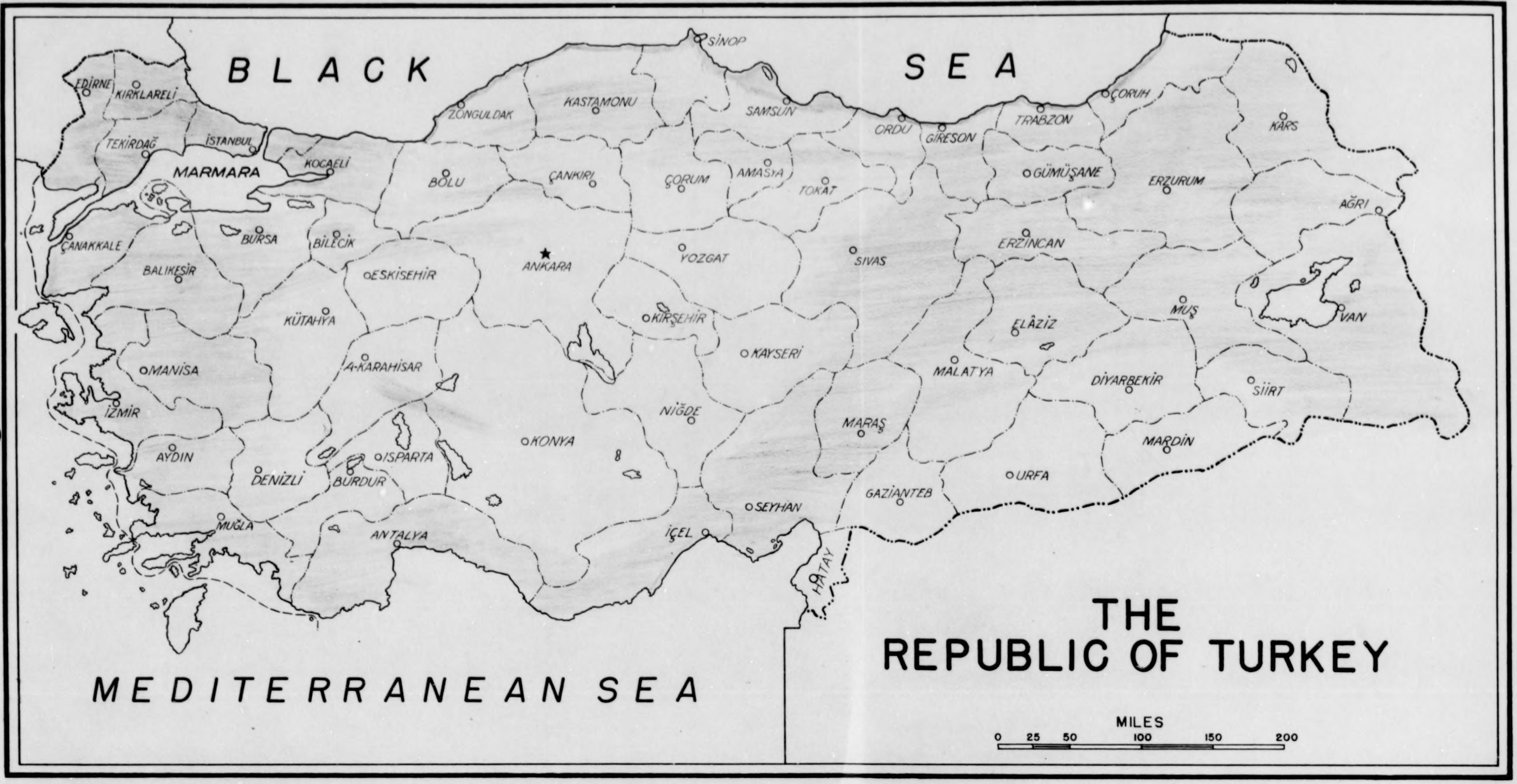
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MARMARA
MEDITERRANEAN SEA
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KIRKLARELİ
TEKİRDAĞ
İSTANBUL
KOCAELİ
ÇANAKKALE
BALIKESİR
BURSA
BİLECİK
ZONGULDAK
KASTAMONU
SİNOP
SAMSUN
ORDU
GİRESON
TRABZON
ÇORUH
KARS
BOLU
ÇANKIRI
ÇORUM
AMASYA
TOKAT
GÜMÜŞANE
ERZURUM
AĞRI
ESKİSEHİR
ANKARA
YOZGAT
SİVAS
ERZİNCAN
VAN
KÜTAHYA
KIRŞEHİR
KAYSERİ
ELÂZİZ
MUŞ
MANİSA
A-KARAHİSAR
MALATYA
DİYARBEKİR
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SEYHAN
MUĞLA
ANTALYA
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HATAY
MILES
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25
50
100
150
200

THE
REPUBLIC OF TURKEY

**Green - under 200 meters altitude**
**Yellow - 200-1000 meters altitude**
**Brown - above 1000 meters**

7-4

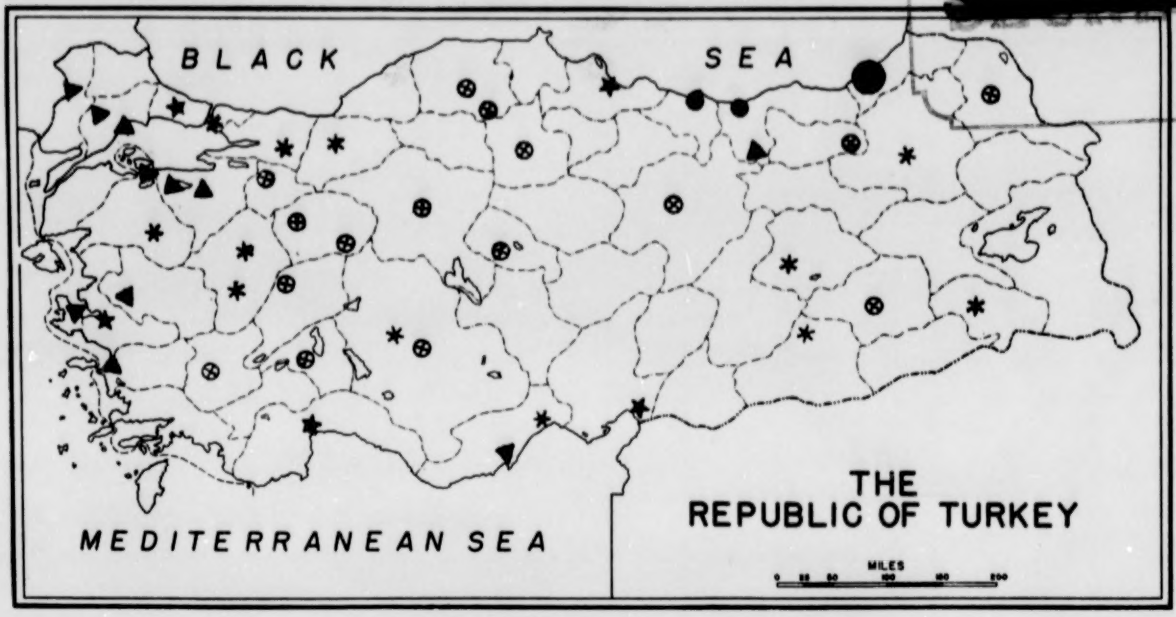
## 2. CLIMATE AND WEATHER

Lowland Thrace has climate and weather conditions much like the District of Columbia. Istanbul is said to have two kinds of weather: Russian, when the winds are from the north, and Egyptian, from the south wind. The Black Sea littoral gets much wind and rain in winter, but at its eastern end the climate is subtropical to the extent that much citrus fruit is grown. The Aegean coast resembles southern California, with a bit more freezing weather in mid-winter. The Mediterranean coastal plain enjoys moderate winters and hot summers characterized by citrus and cotton cultivation.

The steppe lands resemble the American wheat belt in temperatures and rainfall. The climate in the mountains approximates that in the Rocky Mountain region at like elevations.

Snow is more abundant than might be implied from the precipitation record. While the steppes are not white throughout the winter, the occurrence of a lie of from one to three feet is a continual threat during this season. In the east all but the main roads may be blocked for weeks at a stretch, and the Trabzon-Iran Highway occasionally is snowbound for two or three days.

[redacted]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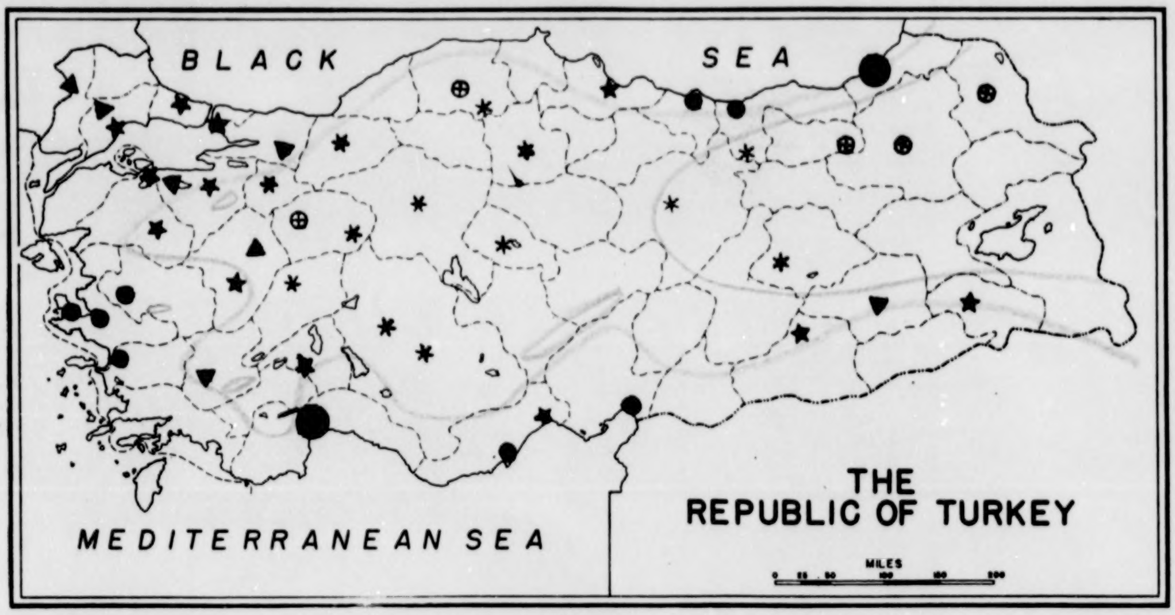
Autumn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Winter

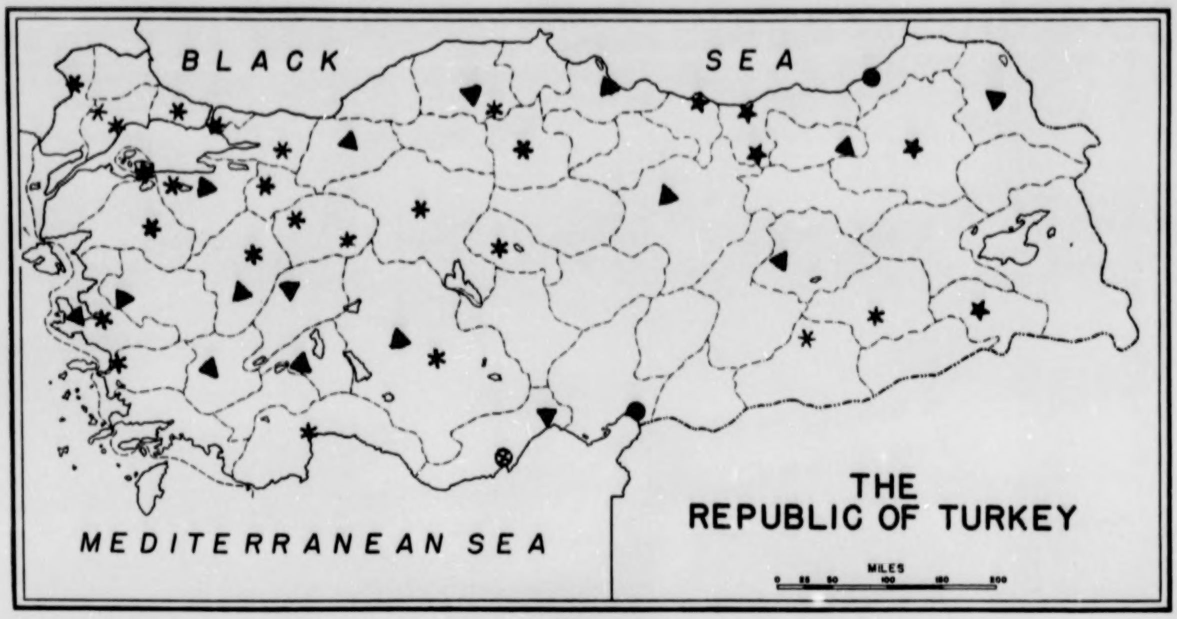
approximate snow line, mid-December to March

" " " November till April

AVERAGE SEASONAL PRECIPITATION
(1930-1938)

Compiled from data from forty-seven weather stations

| | Mm. | Inches | | Mm. | Inches |
|---|---|---|---|---|---|
| △ | 0- 25 | (0- .9) | ▲ | 151-200 | (6. - 7.9) |
| ○ | 26- 50 | (1-1.9) | ★ | 201-300 | (8. -11.8) |
| ⊕ | 51-100 | (2-3.9) | ● | 301-500 | (11.9-19.7) |
| ✱ | 101-150 | (4-5.9) | ⬤ | 500+ | (19.7+ ) |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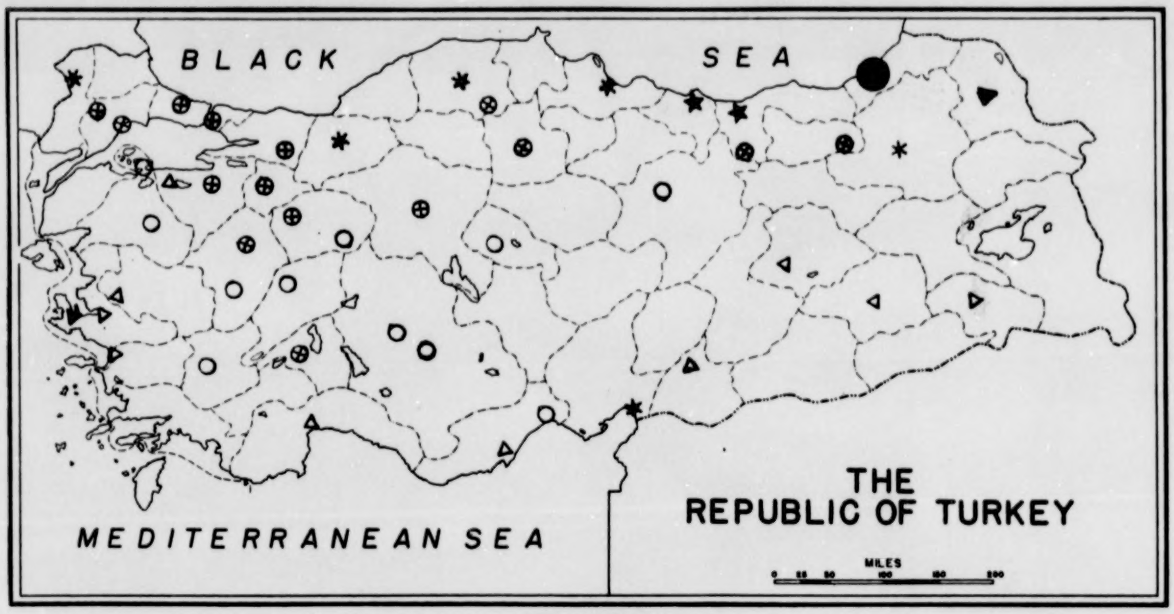
Spring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0 25 50 100 150 200

Summer

AVERAGE SEASONAL PRECIPITATION
(1930-1938)

Compiled from data from forty-seven weather stations

| | Mm. | Inches | | Mm. | Inches |
|---|---|---|---|---|---|
| △ | 0- 25 | (0- .9) | ▲ | 151-200 | (6. - 7.9) |
| ○ | 26- 50 | (1-1.9) | ★ | 201-300 | (8. -11.8) |
| ⊕ | 51-100 | (2-3.9) | ● | 301-500 | (11.9-19.7) |
| ✱ | 101-150 | (4-5.9) | ⬤ | 500+ | (19.7+ ) |

7-5

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# TURKEY

## 3. HEALTH CONDITIONS

Turkey enjoys the lowest morbidity rate of all the Near East. The only diseases there against which American (and presumably other) soldiers are not immunized may be avoided by observing precautions. These diseases are syphilis, gonorrhea, malaria and trachoma. Malaria is almost entirely seasonal and trachoma occurs little outside the southern provinces. From the health standpoint, winter is the best time for conducting a campaign in the western half of the country so long as armies can supply their own shelter. Billeting in residences would involve hazards, especially tuberculosis and influenza.

## TURKEY

## 4. COMMUNICATIONS

Postal and telegraph systems are government operated. There are a thousand post offices (355 towns and cities exceeding 1,000 population), at 350 of which there are telegraph stations. Telegraph lines extend 19,000 miles, involving the use of 43,000 miles of wire and 325 miles of cable (area of Turkey 294,492 square miles). The principal sites have local telephone cities and in Western Anatolia the largest cities are connected by long distance telephone. All gendarme stations, which blanket the country, are connected by telephone, but since the circuits are ground (not metallic) and there are no booster stations, relaying of messages is necessary in cases of longer distances. There are several commercial and numerous military wireless stations.

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## TURKEY

### 4. Communications - Railways and Highways

The usefulness of Turkey as an avenue to Syria and Iraq is limited by the railways' capacity. While the highways now receive considerable commercial use, and are good enough to carry mechanized invasion forces, they are inadequate to the transport needs of supplying a large army (and carrying back loot).

Estimates of the capacity of the rail lines follow:

HAYDARPASA, BANDIRMA & IZMIR to ALEPPO & ISKENDERON

(According to Land Routes of Turkey)

| | |
|---|---|
| Trains per day | 16 - 24 |
| Tons per train: | 360 |
| Total net tons per day: | 5,760 - 8,640 |
| Equipment involved: (in active use) | |
| Number of trains | 112-168 |
| Number of cars | 4,480-6,720 |
| Number of locomotives | 112 - 168 |

(According to Handbook of Turkish Railways)

| | |
|---|---|
| Trains per day: | 20 - 30 |
| Tons per train: | 200 |
| Total net tons per day: | 4,000 - 6,000 |
| Equipment involved: (in active use) | |
| Number of trains | 140 - 210 |
| Number of cars | 3,080 - 4,620 |
| Number of locomotives | 140 - 210 |

Mean of the two estimates:

| | |
|---|---|
| Trains per day: | 22 |
| Tons per train: | 277 |
| Total net tons per day: | 6,100 |
| Equipment involved: (in active use) | |
| Number of trains | 154 |
| Number of cars | 4,774 |
| Number of locomotives | 154 |

Note: These estimates are based on the assumption that it would take a freight train 2 days to reach Aleppo or Iskenderon via Ulukişla, and 3 days via Malatya. One day at each end has been allowed for loading or unloading. Six days by the first route, and eight days by the second is therefore considered the minimum time for a complete round trip.

The estimates in the Handbook of Turkish Railways seem to have been worked out with greater care than those in Land Routes of Turkey. The lower figures in the Handbook estimates are considered practical capacity, the higher theoretical capacity.

Rolling stock is considered sufficient to maintain these two routes at capacity. No consideration has been given the effect of a certain amount of non-military traffic which would have to be maintained, nor the effect of damage to the line.

The Handbook on Turkish Railways makes the following estimate, without explaining just how the conclusions were reached:

Daily Capacity:

| | |
|---|---|
| Haydarpaşa - Ankara - Fevzipaşa | 2,000 - 2,500 tons |
| Bandirma - Afyon - Fevzipaşa (or Izmir) | 2,500 - 3,000 tons |
| Total | 4,500 - 5,500 tons |

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7-9

"To operate these two channels of transport to capacity simultaneously (allowing for about 25% of locomotives under repair) would require between 500 and 600 engines, of which 350 would have to be main line units. With existing stock there would be no locomotives over for the remainder of the system."

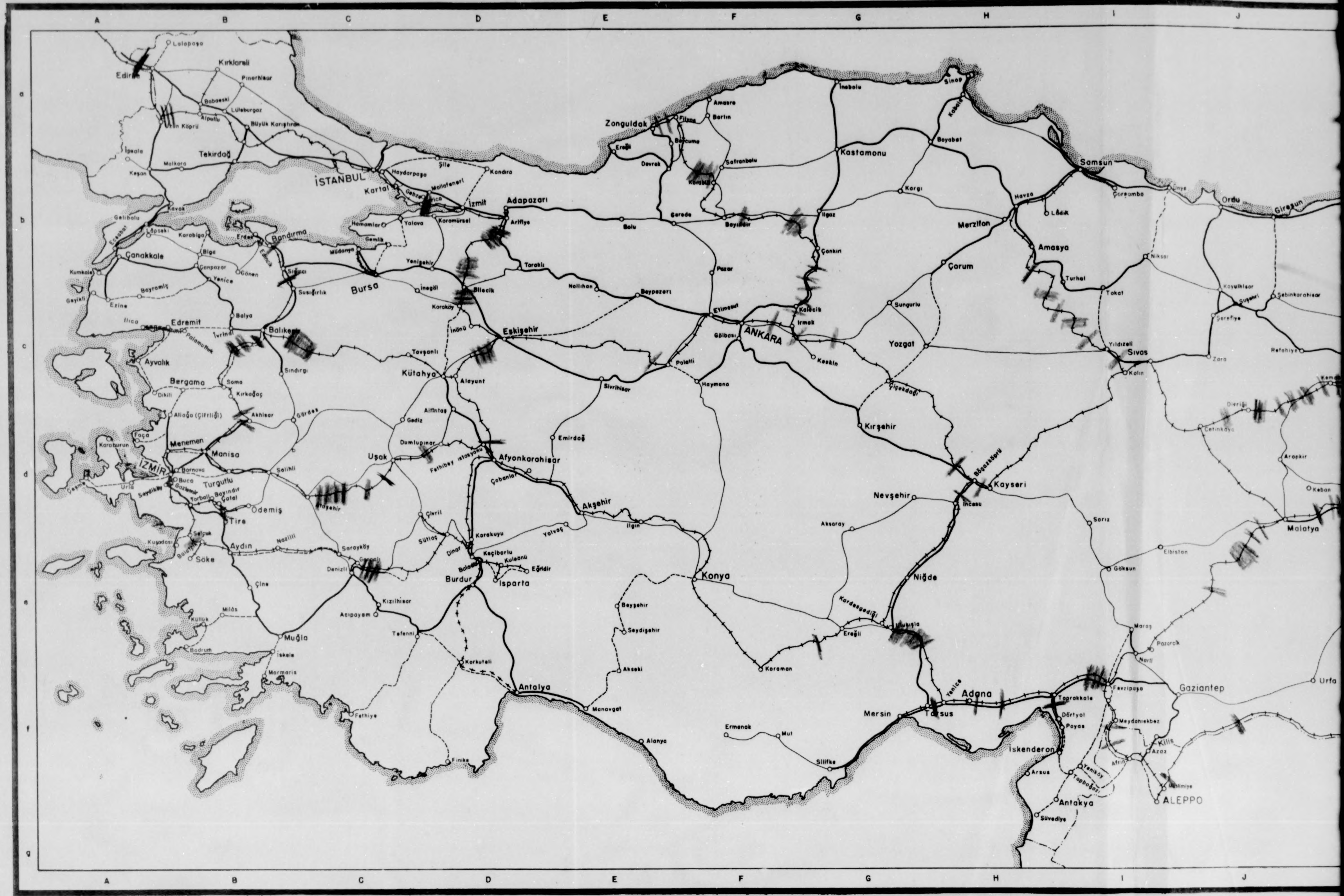
The above totals could be increased 25% by additional passing loops and water supply, but this would take some time.

The vulnerability of the railways is to be noted. Due to the rugged terrain there is a large number of bridges and tunnels which could be destroyed by retreating armies and/or guerrillas. It is conceivable that Germany might subdue Turkey, after a campaign of several months of expensive campaigning, but be unable to use it as a transport channel or base of large-scale operations because of the limited facilities for carrying freight.

Due to its large size, the following document has been filmed in segments. The order of the segments is as follows: left to right, top to bottom.

MAP I

# PRINCIPAL LAND TRANSPORT ROUTES OF TURKEY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Şebinkarahisar
Refahiye
Ünye
Ordu
Giresun

MAP NO. 432, APRIL 15, 1942

▮ **Tunnel areas**

▨ **Bridge areas**

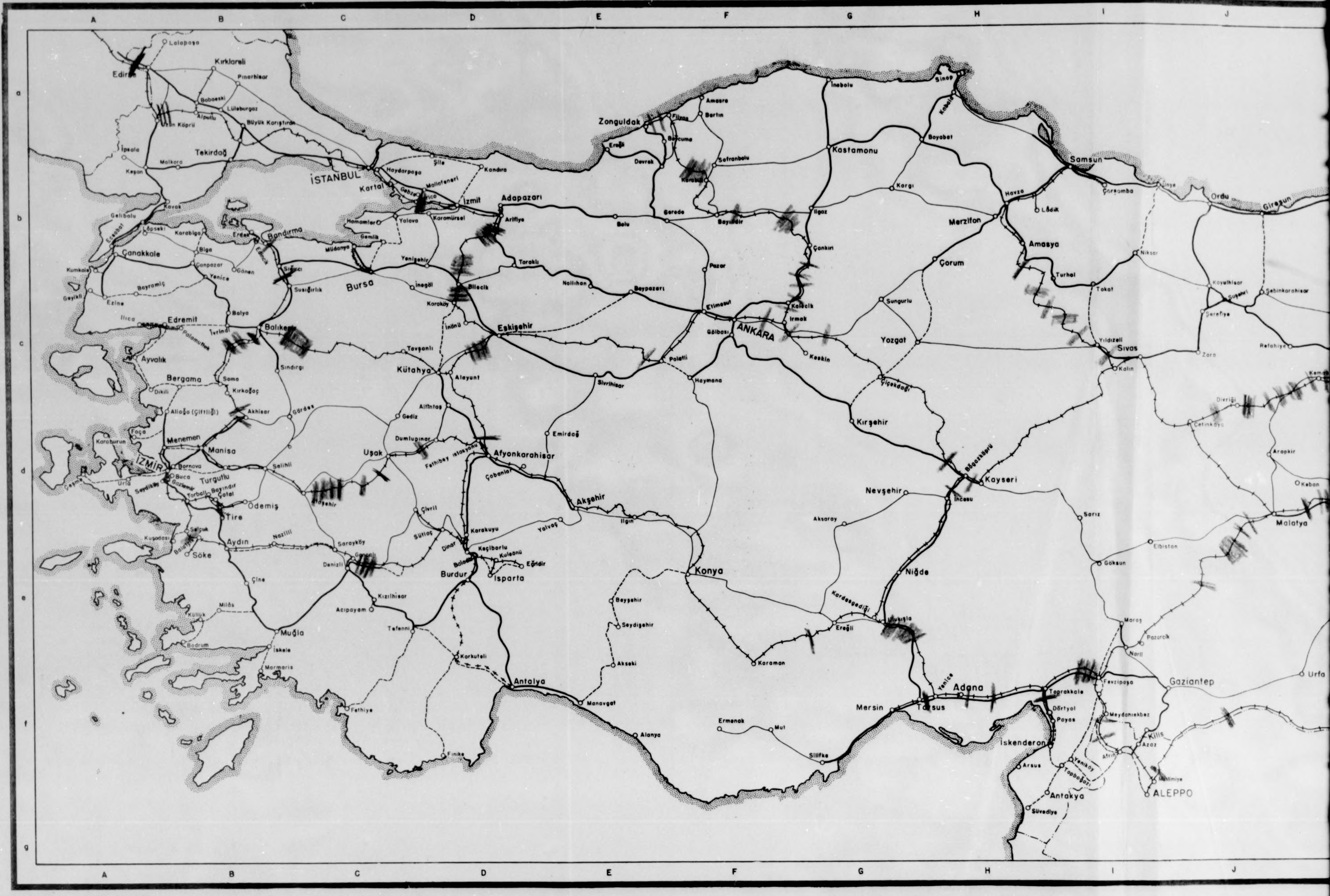
| CITIES | POPULATION |
|---|---|
| ○ ANKARA | Over 100,000 |
| ○ Konya | 50,000 - 100,000 |
| ○ Tarsus | 10,000 - 50,000 |
| ○ Elmali | Under 10,000 |

RAILROADS
- Standard Gauge (1.44 m.)
- Narrow Gauge (0.75 m.)
- Wide Gauge (1.524 m.)
- Narrow Gauge (1.05 m.)
- Proposed Routes

SOURCE

MAP I

# PRINCIPAL LAND TRANSPORT ROUTES OF TURKEY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Malkara
Keşan
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Eskişehir
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Kütahya
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Gediz
Altıntaş
Dumlupınar
Uşak
Fethibey istasyonu
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Tarsus
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Ereğli
Ulukışla
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Boğazköprü
Kırşehir
Çiçekdağı
Yozgat
Sungurlu
Çorum
Keskin
Ankara
Gölbaşı
Polatlı
Haymana
Sivrihisar
Emirdağ
Etimesut
Irmak
Kalecik
Çankırı
Ilgaz
Zonguldak
Ereğli
Devrek
Filyos
Amasra
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Çaycuma
Safranbolu
Karabük
Gerede
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Bayındır
Taraklı
Nallıhan
Beypazarı
Pazar
İnebolu
Kastamonu
Kargı
Sinop
Boyabat
Merzifon
Havza
Lâdik
Amasya
Turhal
Tokat
Samsun
Çarşamba
Ünye
Ordu
Giresun
Niksar
Koyulhisar
Suşehri
Şebinkarahisar
Şerefiye
Zara
Refahiye
Yıldızeli
Sivas
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Divriği
Çetinkaya
Arapkir
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Malatya
Şarız
Elbistan
Göksun
Maraş
Pazarcık
Narlı
Gaziantep
Urfa
Fevzipaşa
Toprakkale
Dörtyol
Payas
Meydanıekbez
İskenderun
Arsus
Kilis
Azaz
Afrin
Yeniköy
Topboğazı
Antakya
Süveydiye
Müslimiye
ALEPPO

MAP NO. 432, APRIL 15, 1942

▮ Tunnel areas

▨ Bridge areas

| CITIES | POPULATION |
|---|---|
| ○ ANKARA | Over 100,000 |
| ○ Konya | 50,000 - 100,000 |
| ○ Tarsus | 10,000 - 50,000 |
| ○ Elmali | Under 10,000 |

RAILROADS

- Standard Gauge (1.44 m.)
- Narrow Gauge (0.75 m.)
- Wide Gauge (1.524 m.)
- Narrow Gauge (1.05 m.)
- Proposed Routes

SOURCE

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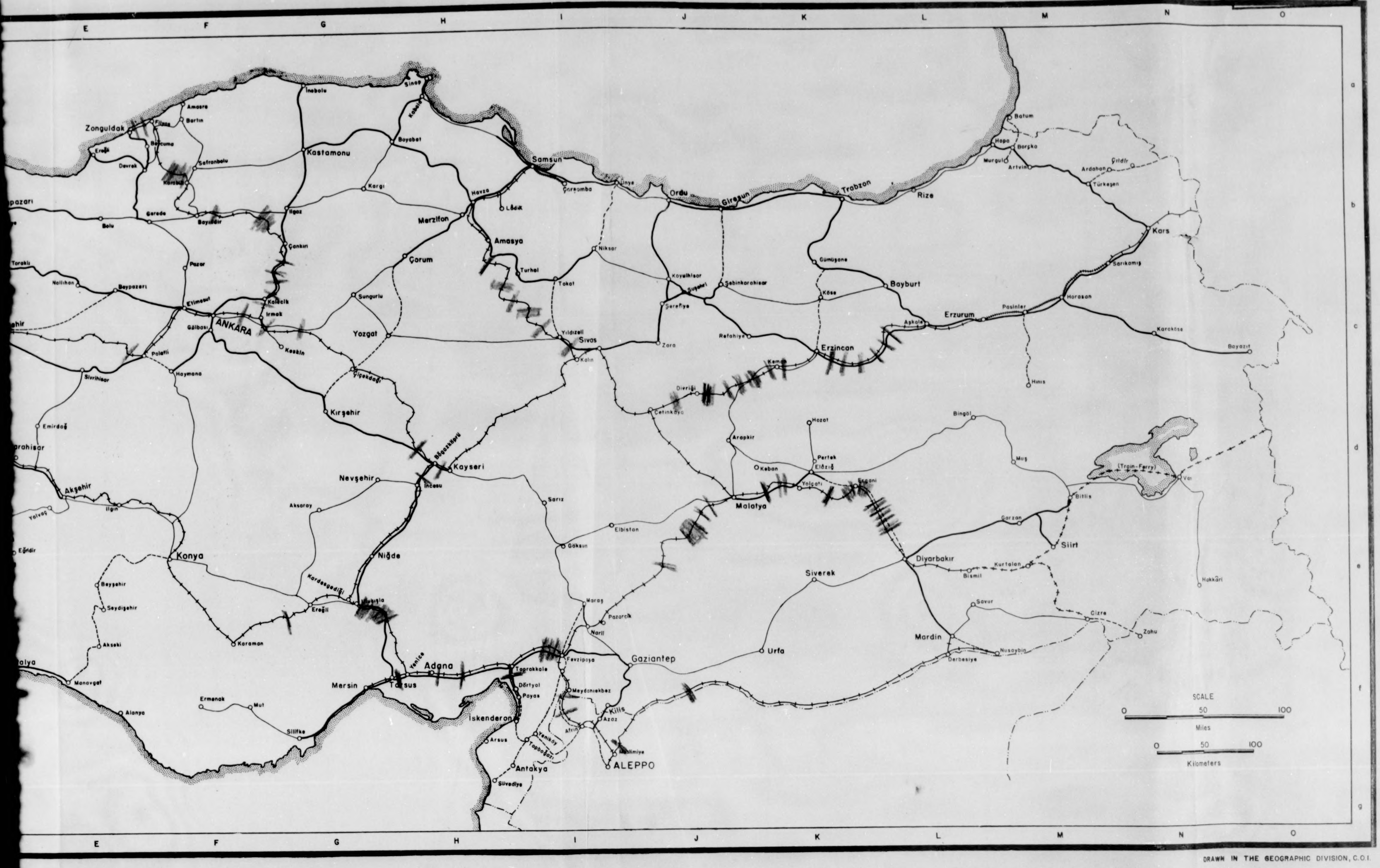
# PRINCIPAL LAND TRANSPORT ROUTES OF TURKEY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Ereğli
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Safranbolu
Karabük
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Boyabat
Kastamonu
Samsun
Çarşamba
Ünye
Ordu
Giresun
Trabzon
Rize
Batum
Hopa
Borçka
Artvin
Murgul
Ardahan
Çıldır
Türkeşen
Kars
Sarıkamış
Horasan
Karaköse
Bayazıt
Pasinler
Erzurum
Aşkale
Bayburt
Gümüşane
Köse
Erzincan
Kemah
Divriği
Çetinkaya
Hınıs
Bolu
Gerede
Bayındır
Ilgaz
Kargı
Havza
Lâdik
Merzifon
Amasya
Turhal
Tokat
Niksar
Koyulhisar
Suşehri
Şebinkarahisar
Şerefiye
Zara
Refahiye
Yıldızeli
Sivas
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Sungurlu
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Pazar
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Polatlı
Haymana
Sivrihisar
Çiçekdağı
Kırşehir
Boğazköprü
Kayseri
Nevşehir
İncesu
Emirdağ
Akşehir
Yalvaç
Ilgın
Aksaray
Sarız
Elbistan
Göksun
Niğde
Konya
Eğridir
Beyşehir
Seydişehir
Akseki
Karaman
Kardeşgediği
Ulukışla
Ereğli
Yenice
Adana
Mersin
Tarsus
Manavgat
Alanya
Ermenak
Mut
Silifke
Toprakkale
Dörtyol
Payas
İskenderon
Arsus
Antakya
Süvediye
Yenikoy
Topboğazı
Afrin
Azaz
Kilis
Meydanıekbez
Fevzipaşa
Maraş
Pazarcık
Narlı
Gaziantep
ALEPPO
Müslimiye
Urfa
Siverek
Malatya
Arapkir
Keban
Hozat
Pertek
Elâzığ
Yolçatı
Ergani
Bingöl
Muş
Bitlis
Van
(Train-Ferry)
Garzan
Siirt
Diyarbakır
Bismil
Kurtalan
Savur
Mardin
Derbesiye
Nusaybin
Cizre
Zaho
Hakkâri
SCALE
0
50
100
Miles
0
50
100
Kilometers

DRAWN IN THE GEOGRAPHIC DIVISION, C.O.I.

| CITIES | POPULATION |
|---|---|
| NKARA | Over 100,000 |
| onya | 50,000 - 100,000 |
| rsus | 10,000 - 50,000 |
| ali | Under 10,000 |

RAILROADS

- Standard Gauge (1.44 m.)
- Narrow Gauge (0.75 m.)
- Wide Gauge (1.524 m.)
- Narrow Gauge (1.05 m.)
- Proposed Routes

SOURCES OF ROAD DATA

- British
- Turkish
- British and Turkish

## TURKEY

### 5. VITAL AREAS

The army under post World War I treaties has been unable to fortify the European frontier. Trakya (European Turkey) is difficult to defend. However, heavy expenditures have been made on the Çatalca Line, some 40 miles west of Istanbul. This demonstrates the seriousness of Turkish resolve to defend this territory. Estimates vary as to the length of time European soil can be held. There is a definite limit to the maximum forces which can be operated in attack in this area. It is clear that the Turks are prepared to sacrifice eight divisions in a delaying action and that they may be expected to declare and make the old sections of Istanbul open city, to prevent destruction of antiquities. They might hold out a month, or they might yield this penninsula in a week. The defenses of the Dardanelles are strongest against a sea attack, long feared from Italy.

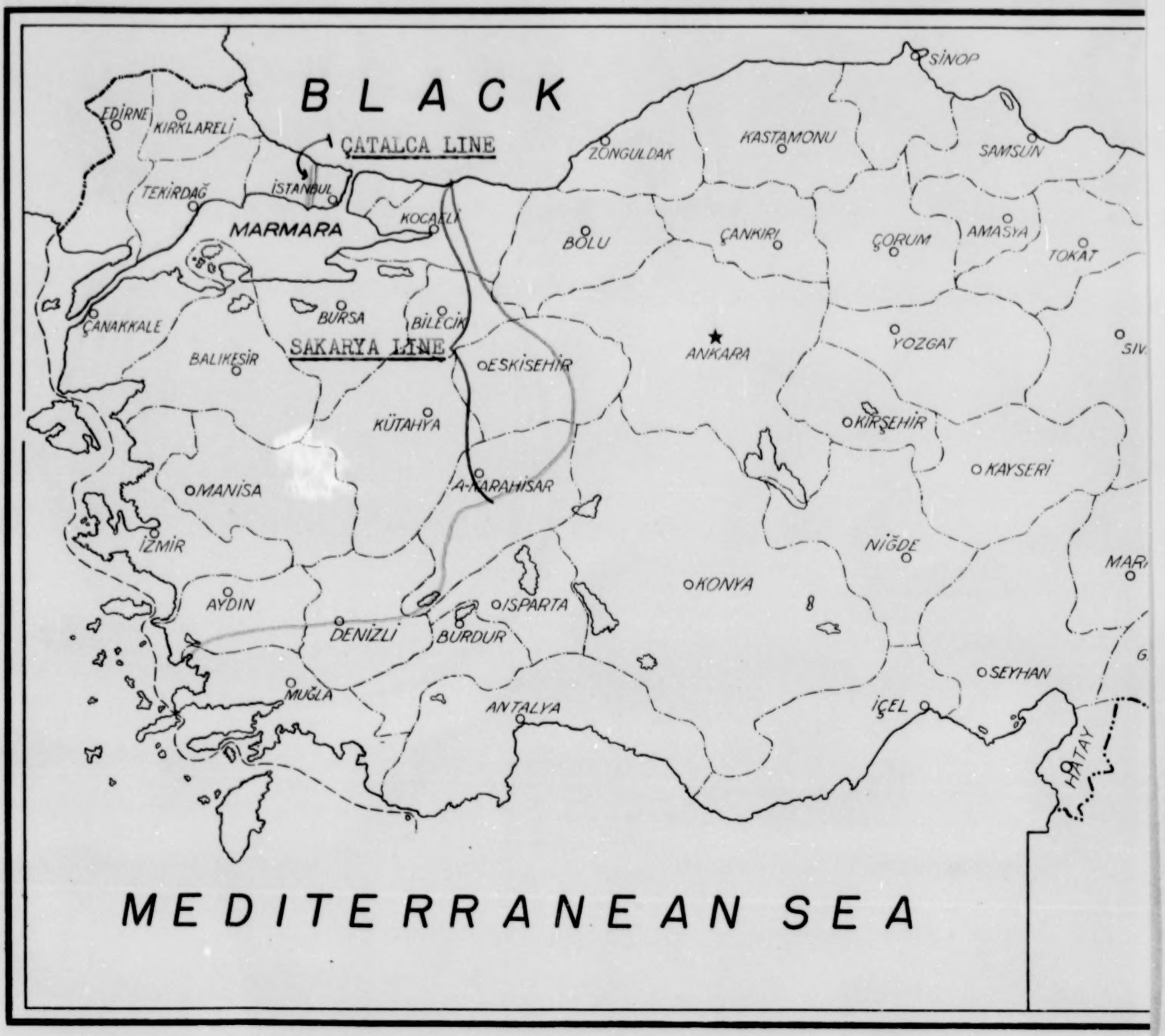
The next most vulnerable area is the Aegean littoral. Especially opposite Mitilene, but also opposite the Greek and the Italian islands there are many good landing beaches and small harbors from which broad valleys offer easy access far toward the interior. The Menderes (debauching 25 miles south of Kuşadasi, 63 miles south of Izmir, opposite Samos) presents flood conditions during much of the winter and early spring, and the Gediz (emptying 25 miles NW of Izmir, into the Gulf of Izmir) fills nearby marshes during much of the rainy season. The principal fixed defenses except the Çatalca Line and at the Straits surround the Gulf of Izmir. One of the chief military zones, Foça - Menemen, also commands the Gediz delta and the road from vulnerable beaches to the north.

The Black Sea coast, because it lacks beaches and harbors offers few points of easy ingress. Because of its mild climate the Rize-Hopa coastal plain, the narrow, might be considered as a base for operations against Batum -- if the Germans could get there by sea. However, the most vital area on the Black Sea is the Zonguldak coal basin, which is depended upon to supply over three million tons per year of fuel to Turkish industry, railways and homes. Inasmuch as the railways have been unable to build more than 10-day stock piles and are not equipped to operate on any other fuel, stoppage of this supply would be most serious.

The southern coast, beyond Cyprus-based protection, is barricaded mostly by mountains and offers no direct access to any Axis goal except the interdiction of rail traffic and the use of a couple of poor air fields. Even if the Adana plain were occupied, getting beyond the Taurus mountains to the north and the Gâvur mountains in Hatay (SE) would be difficult.

Defenses are strongest in the east, where infantry fighting and light ordnance, in which the Turks excel, are most useful.

The strongest defense to invasion from the north and west would be at the Sakarya Line, which is not fortified by fixed installations but has been carefully studied by the General Staff with a view to mobile defense. (The Greeks were stopped here in 1921-22.)


BLACK
ÇATALCA LINE
SAKARYA LINE
MARMARA
MEDITERRANEAN SEA
EDİRNE
KIRKLARELİ
TEKİRDAĞ
İSTANBUL
KOCAELİ
ÇANAKKALE
BALIKESİR
BURSA
BİLECİK
ESKİŞEHİR
KÜTAHYA
A-KARAHİSAR
MANİSA
İZMİR
AYDIN
DENİZLİ
BURDUR
ISPARTA
MUĞLA
ANTALYA
ZONGULDAK
KASTAMONU
BOLU
ÇANKIRI
ANKARA
SİNOP
SAMSUN
ÇORUM
AMASYA
TOKAT
YOZGAT
KIRŞEHİR
KAYSERİ
NİĞDE
KONYA
SEYHAN
İÇEL
HATAY

Limit of Greek advance, 1921

## TURKEY

### 6. PORTS AND NAVAL BASES

The only full-scale naval base is at Izmir (Kocaeli). At Izmir there are mine layers and refueling facilities. The chief ports, in order of their relative annual traffic are: Istanbul, Izmir, Samsun, Trabzon, Giresun, Mersin. All the ports marked in the attached map are used in commerce and would be of more or less use in landing troops and supplies.

Due to its large size, the following document has been filmed in segments. The order of the segments is as follows: left to right, top to bottom.

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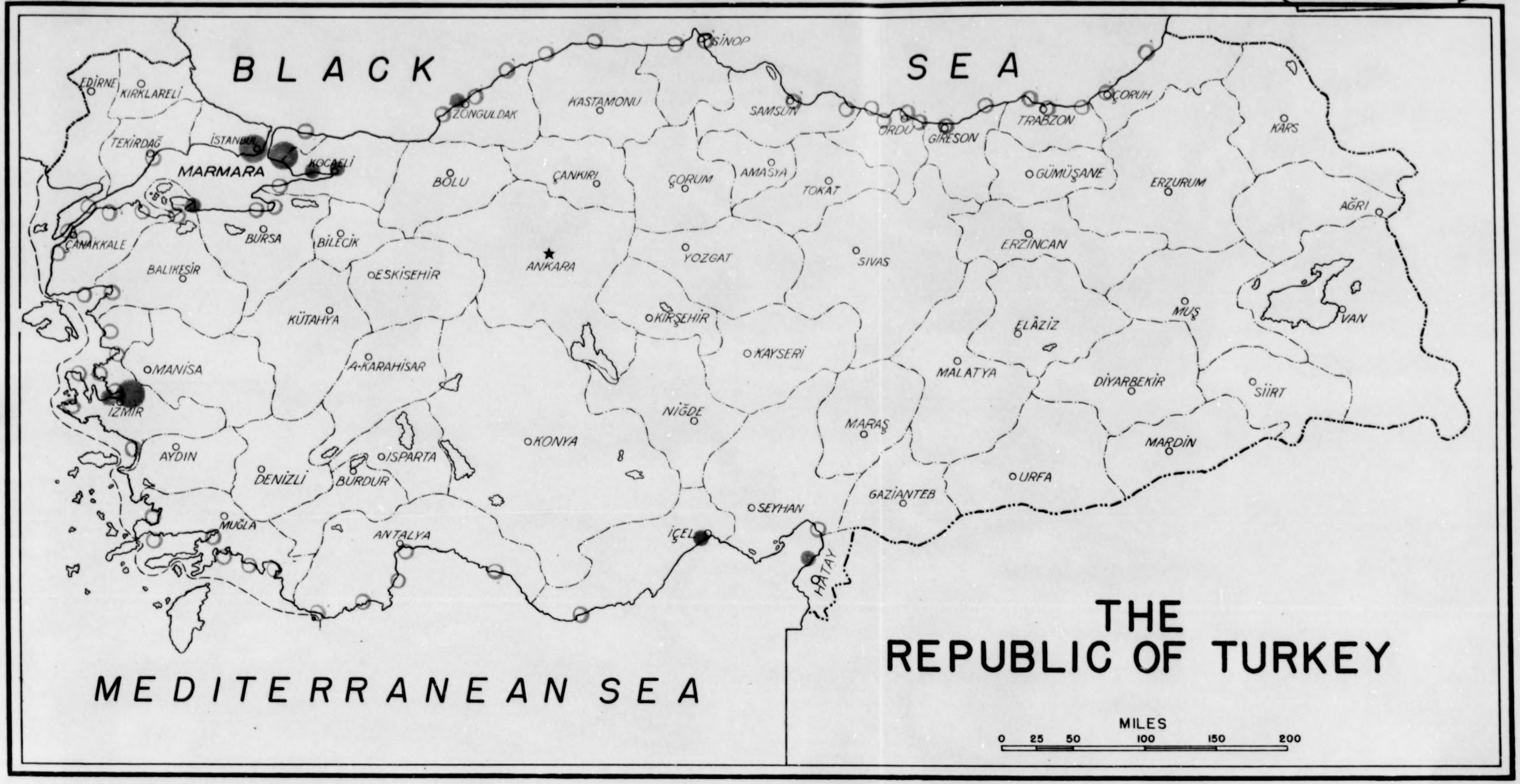

BLACK SEA
SINOP
ZONGULDAK
KASTAMONU
SAMSUN
ORDU
GIRESON
TRABZON
ÇORUH
KARS
EDİRNE
KIRKLARELİ
TEKİRDAĞ
İSTANBUL
KOCAELİ
MARMARA
BOLU
ÇANKIRI
ÇORUM
AMASYA
TOKAT
GÜMÜŞANE
ERZURUM
AĞRI
ÇANAKKALE
BURSA
BİLECİK
ESKİSEHİR
ANKARA
YOZGAT
SIVAS
ERZİNCAN
BALIKESİR
KÜTAHYA
KIRŞEHİR
KAYSERİ
ELÂZİZ
MUŞ
VAN
MANİSA
A-KARAHİSAR
MALATYA
DİYARBEKİR
SİİRT
İZMİR
NİĞDE
MARAŞ
AYDIN
KONYA
ISPARTA
MARDİN
DENİZLİ
BURDUR
URFA
GAZİANTEB
SEYHAN
MUĞLA
ANTALYA
İÇEL
HATAY
THE
REPUBLIC OF TURKEY
MEDITERRANEAN SEA
MILES
0 25 50 100 150 200

● Ports with heavy installations

● Ports with light installations, mainly lighterage service

7-13

~~CONFIDENTIAL~~

## TURKEY

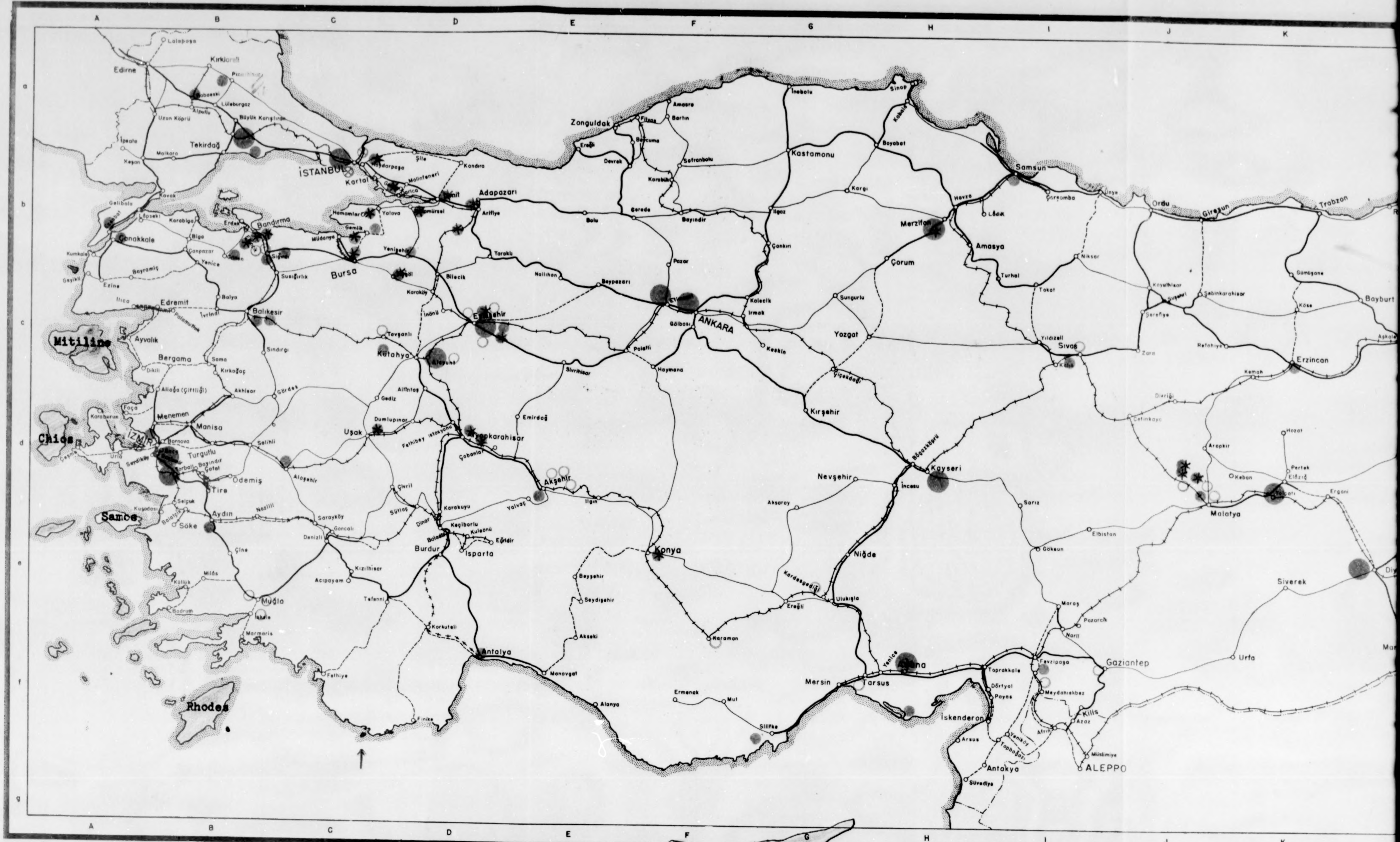
## 7. AIR BASES

The air fields of Turkey have been placed for the most effective defense against invasion from the north and west. While they might provide an element of vulnerability to airborne invasion forces, there are few in the central plateau which will be defended to the last ditch, yet there are enough there to base the entire Turkish air arm plus many allied planes.

There is a scarcity of fields which the Axis might use for fighter plane action against Cyprus and Syria. However, the fields farther north are in fairly good position for the use of defending craft -- Turkish and allied, if occasion arise.

Due to its large size, the following document has been filmed in segments. The order of the segments is as follows: left to right, top to bottom.

# PRINCIPAL LAND TRANSPORT ROUTES OF TURKEY



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Gelibolu
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Bandırma
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Karaburun
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Kartal
Haydarpaşa
Şile
Kandıra
Maltepe
İzmit
Adapazarı
Arifiye
Gölcük
Değirmendere
Yalova
Gemlik
Mudanya
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Yenişehir
İnegöl
Bilecik
Bozüyük
Eskişehir
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Çobanlar
Fethibey istasyonu
Akşehir
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Beyşehir
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Akseki
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Mersin
Tarsus
Adana
Yenice
Ceyhan
Toprakkale
Dörtyol
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Azaz
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Sivrihisar
Emirdağ
Haymana
Kalecik
Irmak
Keskin
Sarız
Mardin
Diyarbakır

MAP NO. 432, APRIL 15, 1942

● Airdromes

● Landing grounds

CITIES

POPULATION

Cyprus

RAILROADS

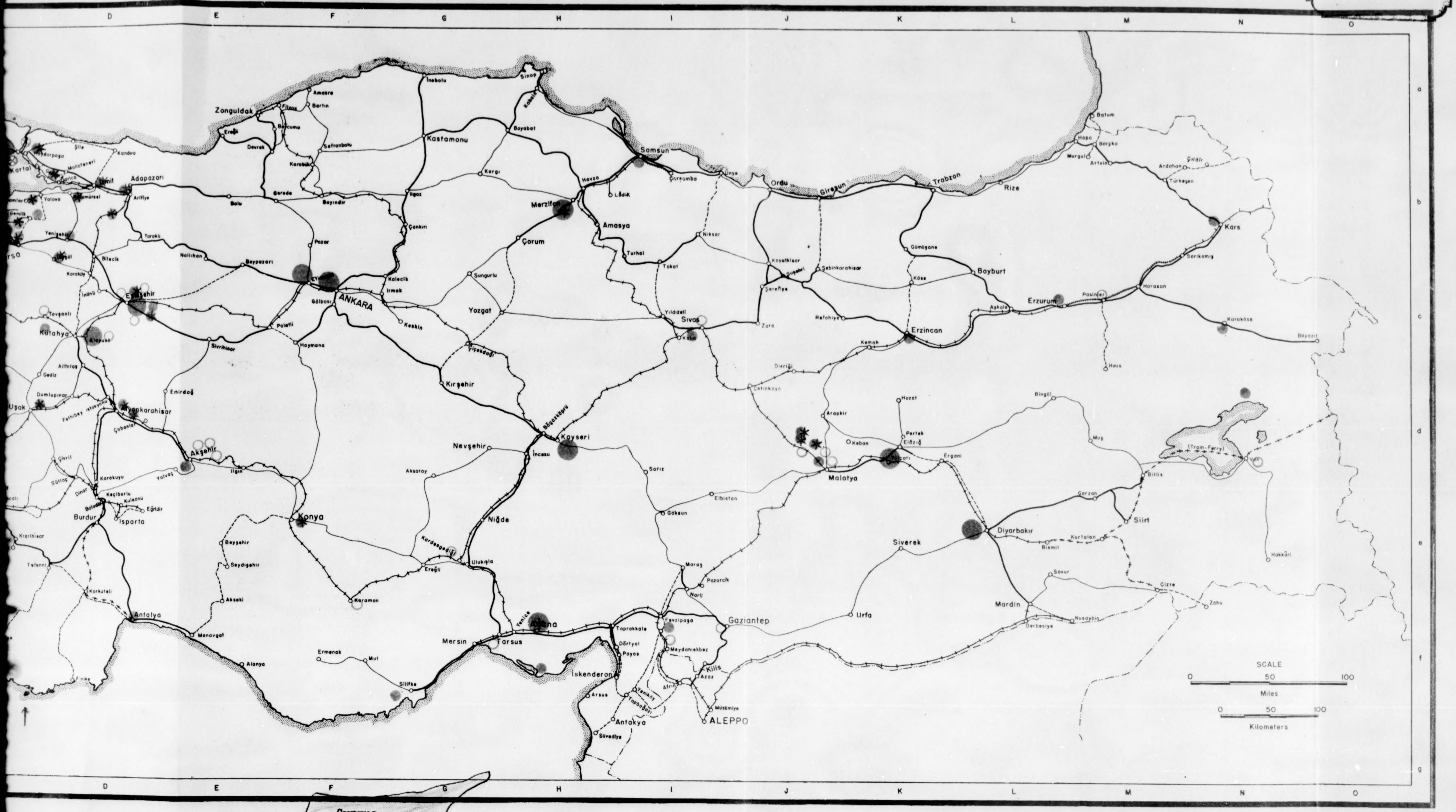
SOURCES OF ROAD DATA

CONFIDENTIAL

~~SECRET~~

CONFIDENTIAL

# PRINCIPAL LAND TRANSPORT ROUTES OF TURKEY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Beypazarı
Bolu
Gerede
Bayındır
Pazar
Polatlı
Sivrihisar
Emirdağ
Haymana
Gölbaşı
ANKARA
Etimesgut
Sarız
Elbistan
Göksun
Maraş
Pazarcık
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Gaziantep
Toprakkale
Dörtyol
Payas
Meydanıekbez
Kilis
Azaz
Afrin
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ALEPPO
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Arsus
Yeniköy
Topboğazı
Antakya
Süvediye
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Yenice
Tarsus
Mersin
Silifke
Mut
Ermenek
Sivas
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Yıldızeli
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Suşehri
Şebinkarahisar
Şerefiye
Refahiye
Ünye
Ordu
Giresun
Trabzon
Rize
Gümüşane
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Bayburt
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Kemah
Divriği
Çetinkaya
Arapkir
Hozat
Pertek
Elâzığ
Keban
Yolçatı
Malatya
Ergani
Bingöl
Muş
Bitlis
Van
(Train-Ferry)
Garzan
Siirt
Diyarbakır
Bismil
Kurtalan
Siverek
Urfa
Mardin
Savur
Derbesiye
Nusaybin
Cizre
Zaho
Hakkâri
Erzurum
Aşkale
Pasinler
Hınıs
Horasan
Sarıkamış
Kars
Karaköse
Bayazıt
Batum
Hopa
Borçka
Murgul
Artvin
Ardahan
Çıldır
Türkeşen
SCALE
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50
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Miles
0
50
100
Kilometers
Cyprus

CITIES POPULATION

RAILROADS

SOURCES OF ROAD DATA

DRAWN IN THE GEOGRAPHIC DIVISION, C.O.I.

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7-14

## TURKEY

### 8. LOCAL SUPPLIES

Turkey is an agricultural country which normally has an export surplus of 80,000 tons of wheat and nearly 100,000 tons of barley and millet. War time storage of reserves, military consumption, and decline in production due to mobilization and economic dislocations, have necessitated the importation of wheat.

Successful invaders could confiscate some grain, but most of it is stored in the producing areas, largely in the most defensible areas. On the other hand, allied defenders would have to ship in most of their food. Fresh and dried fruits and vegetables are the chief exception.

Due to its large size, the following document has been filmed in segments. The order of the segments is as follows: left to right, top to bottom.

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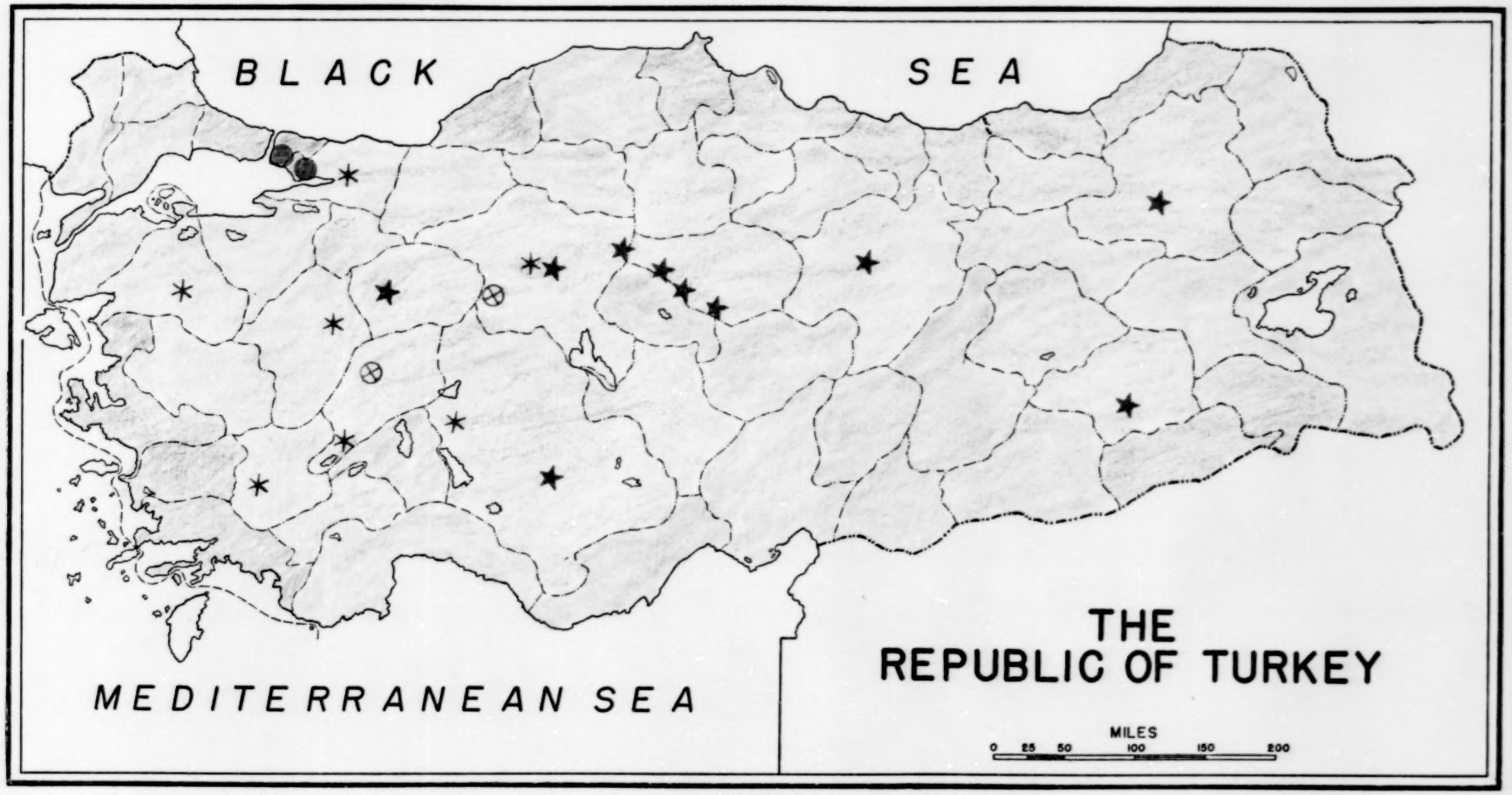
BLACK SEA
MEDITERRANEAN SEA
THE REPUBLIC OF TURKEY
MILES
0 25 50 100 150 200

WHEAT

| | | | |
|---|---|---|---|
| ▨ 311+<br>▨ 211-310<br>▨ 111-210<br>▨ -110 | Production<br>Kilograms per person<br>National average: 419 kilograms | ● 10,000 tons and over<br>⊕ 5,000 tons<br>★ 4,000 tons<br>✳ Less than 4,000 tons | Grain storage "silos" |

~~SECRET~~

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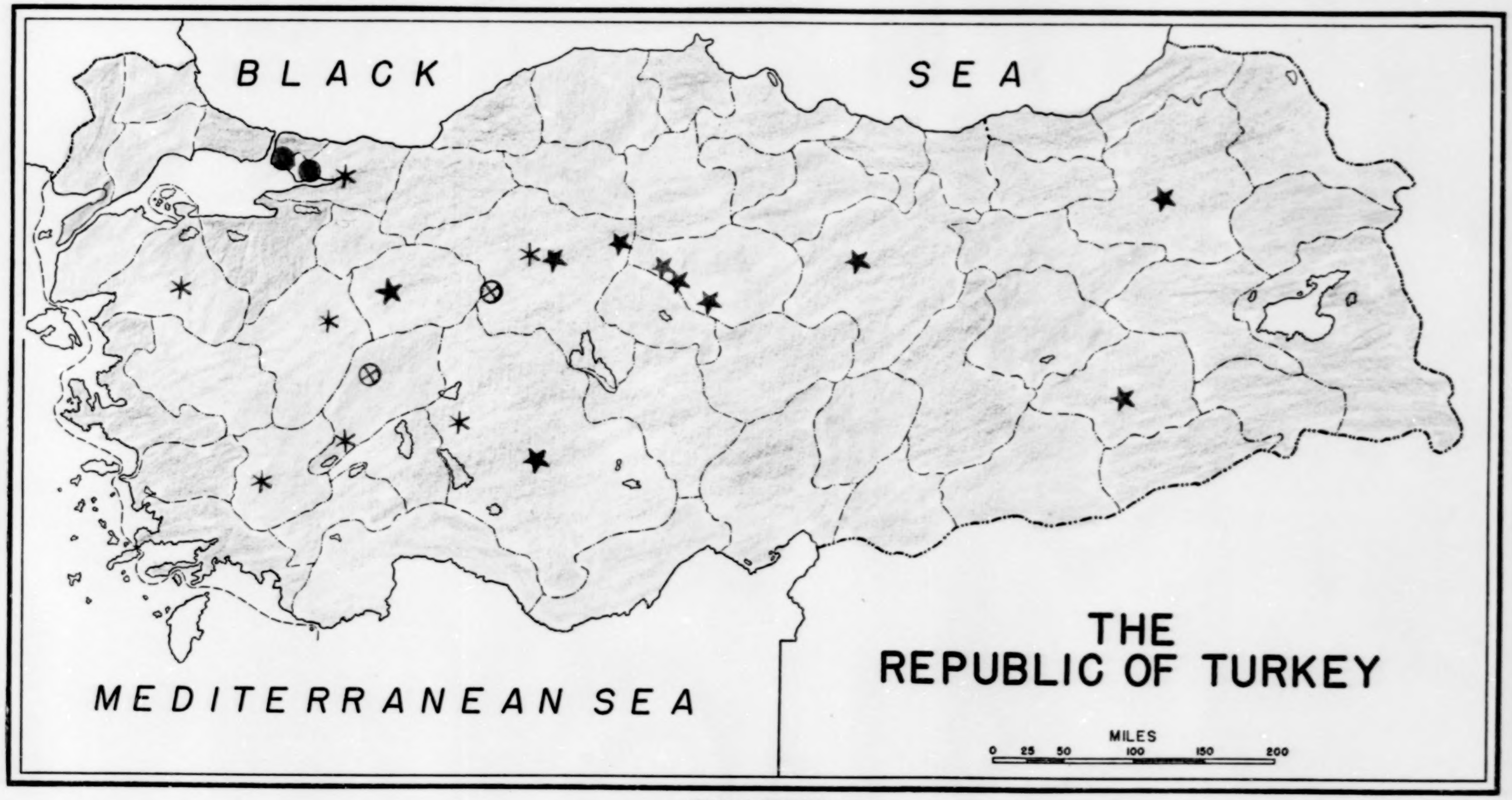
BLACK SEA
MEDITERRANEAN SEA
THE REPUBLIC OF TURKEY
MILES
0 25 50 100 150 200

ALL CEREALS

519+
419-518
319-418
-318

Production
Kilograms per person
National average: 419 kilograms

● 10,000 tons and over
⊗ 5,000 tons
★ 4,000 tons
✳ Less than 4,000 tons

Grain storage "silos"

# TURKEY

## 9. POPULATION

Turkey is not densely populated -- 56 persons per square mile of area, 222 per square mile of arable land -- but the most thickly settled regions would be the first to fall to Axis invaders.

Istanbul is an exceedingly cosmopolitan city. The chief minorities are Greek, Jewish and Armenian. Practically all the first two are strongly pro-United Nations, and only a small portion of the last still think in terms of Armenian nationalism to the extent of aiding Germany and her minions. The chief unassimilated element is the Kurds, who are a majority in the southeast. Prediction of their behavior is risky despite the Turkification of many in the public primary and folk schools.

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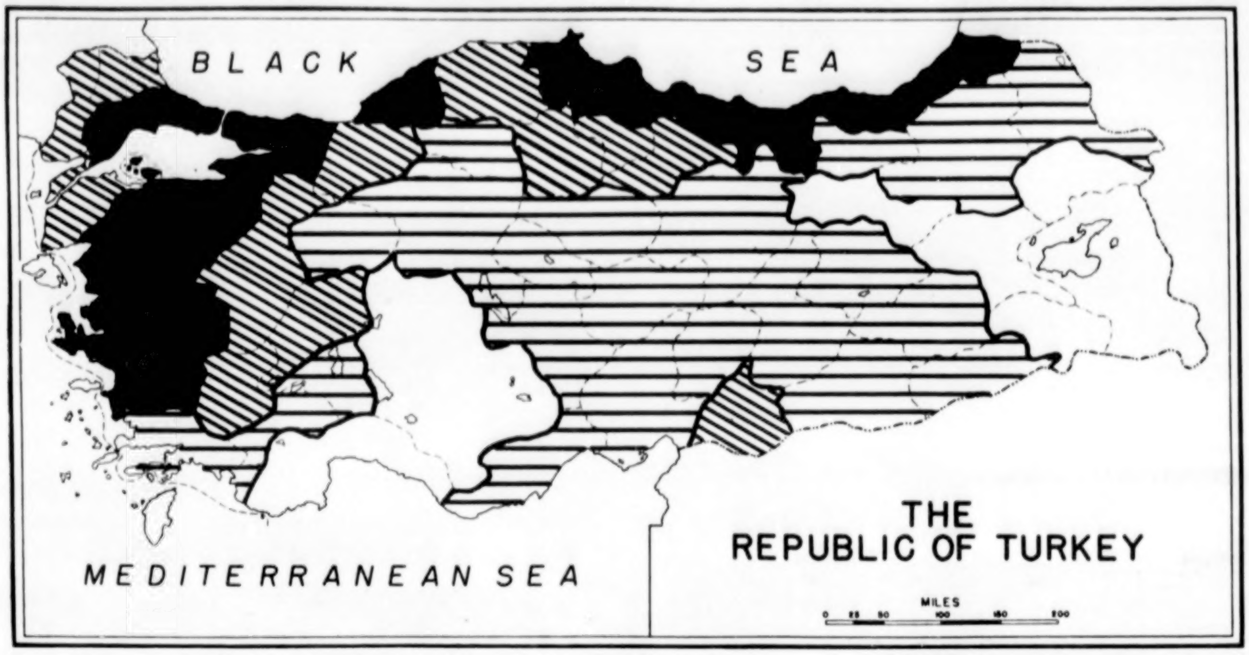
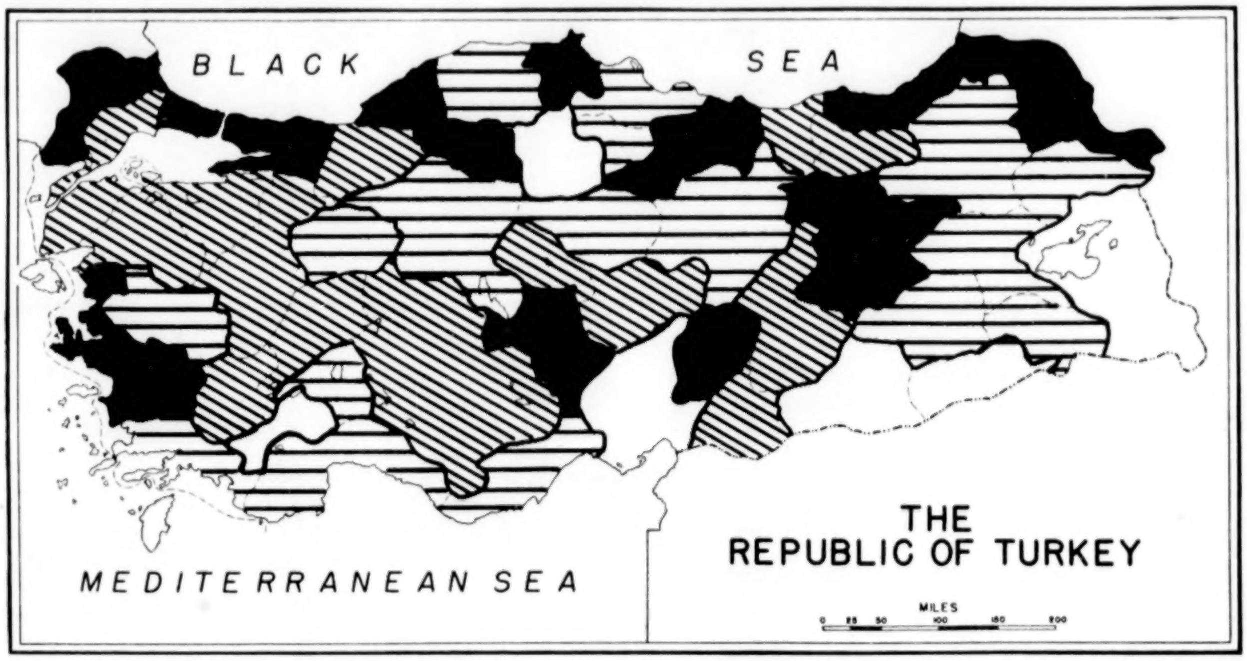

BLACK SEA
MEDITERRANEAN SEA
THE REPUBLIC OF TURKEY
MILES
0 25 50 100 150 200


BLACK SEA
MEDITERRANEAN SEA
THE REPUBLIC OF TURKEY
MILES
0 25 50 100 150 200

Upper Figure
Population Density, Crude
Persons per Square Mile, Total Area
Mean: 56

| Blank | Horizontal | Diagonal | Solid |
|---|---|---|---|
| 11-32 | 33-55 | 56-78 | 79-201 |

Lower Figure
Population Density, Refined
Persons per Square Mile, Arable Land
Mean: 222

| Blank | Horizontal | Diagonal | Solid |
|---|---|---|---|
| 31-142 | 143-222 | 223-302 | 303-1037 |

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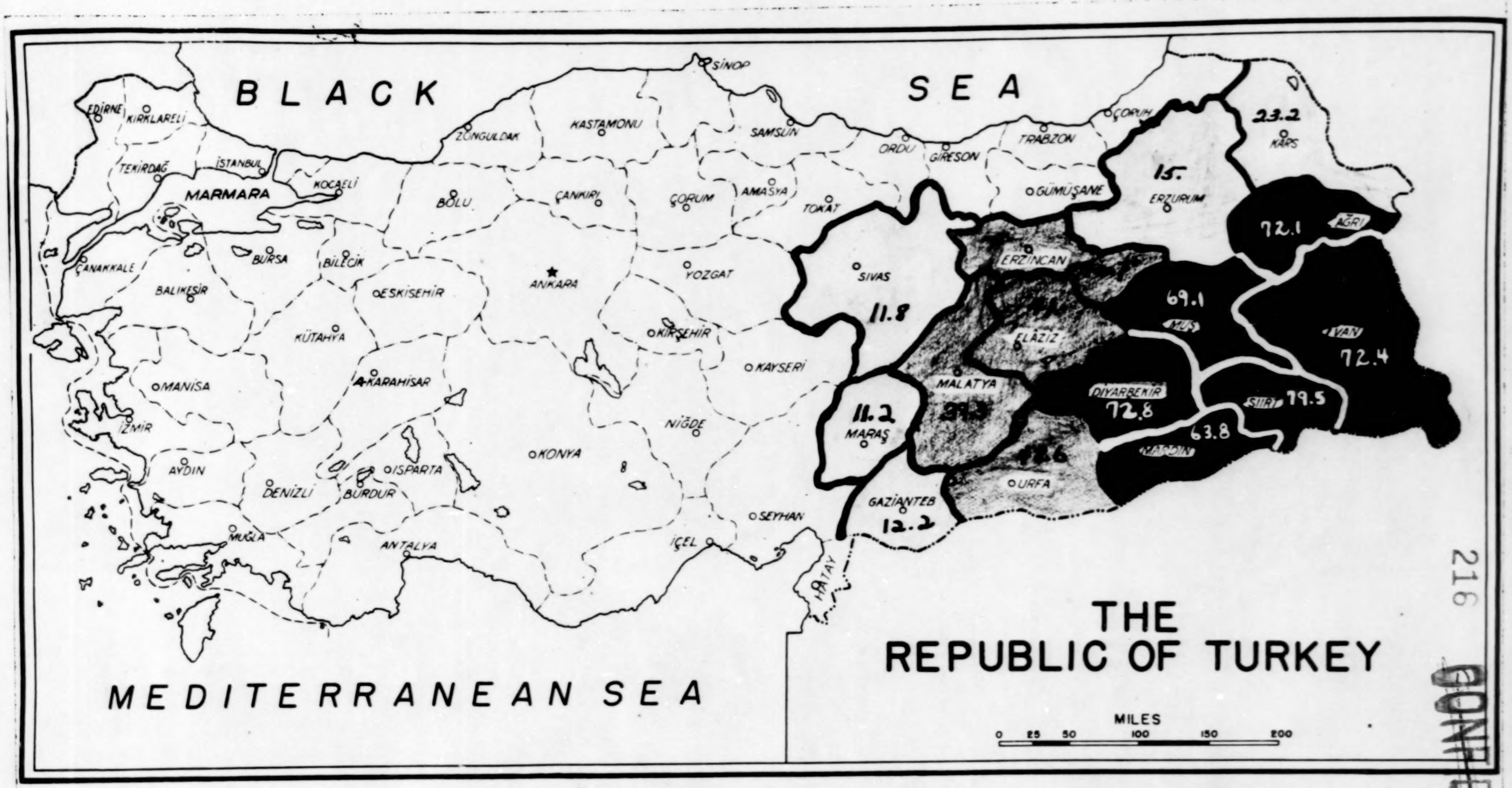

THE
REPUBLIC OF TURKEY
BLACK SEA
MEDITERRANEAN SEA
MARMARA
MILES
0 25 50 100 150 200
EDİRNE
KIRKLARELİ
TEKİRDAĞ
İSTANBUL
KOCAELİ
ÇANAKKALE
BALIKESİR
BURSA
BİLECİK
MANİSA
İZMİR
AYDIN
MUĞLA
DENİZLİ
BURDUR
ISPARTA
ANTALYA
KÜTAHYA
ESKİŞEHİR
AFKARAHISAR
BOLU
ZONGULDAK
KASTAMONU
ÇANKIRI
ANKARA
KONYA
SİNOP
SAMSUN
ÇORUM
AMASYA
TOKAT
YOZGAT
KIRŞEHİR
KAYSERİ
NİĞDE
İÇEL
SEYHAN
HATAY
ORDU
GİRESON
TRABZON
GÜMÜŞANE
ÇORUH
KARS
23.2
ERZURUM
15.
SIVAS
11.8
MARAŞ
11.2
GAZİANTEB
12.2
ERZİNCAN
ELÂZIZ
MALATYA
URFA
AĞRI
72.1
MUŞ
69.1
VAN
72.4
DİYARBEKİR
72.8
SİİRT
79.5
MARDİN
63.8

Kurds – Percentage of Population, by Vilâyets

8-1

~~CONFIDENTIAL~~

CLASSIFICATION
Changed to
UNCLASSIFIED

# GENERAL APPENDIX

## Mediterranean Weather and Climate.

# MEDITERRANEAN

## WEATHER AND CLIMATE

### Appendix on General Characteristics

The central fact of the climate of the Mediterranean region is the existence of dry summers and wet winters. The storms that bring the winter rainfall, with resulting mud and floods, also bring other elements of strategic importance, including low clouds, strong winds, swell and rough water, and, in the mountains, snow. In winter the storms move in from a westerly quarter at the rate of about 8 per month in the western Mediterranean, 6 per month in the eastern, following a general path towards the east. Each storm ordinarily means one or two days' rain in any given locality although the length and intensity of storms are extremely variable. Over most of the Mediterranean the rain comes in short, cold, intense showers, followed by spells of sunshine, so that even days with rainfall usually have some hours of good visibility. Winter weather is highly changeable, with cold stormy days alternating with mild sunny days. Temperatures even in midwinter are usually well above freezing: most stations on the north shores have mean January temperatures of about 45° F., and on the south shores 55° F., though cold north winds (the Mistral in the west and the Bora in the east) sometimes bring freezing weather to the north coasts.

### Rainfall

Rainfall differs greatly from place to place in amount and in the time of the cool season in which concentrated. December rainfall is between $1\frac{1}{2}$ and 8 inches. On the whole, the north shores of the Mediterranean are much wetter than the south, and the western end is wetter than the eastern. Coasts with eastern exposure are drier than those with western: thus eastern Spain, Italy, and Greece are drier than their western counterparts (see map of rainfall). Still drier conditions characterize the broad interior plateaus of Turkey and Spain. On the other hand, mountains everywhere have more rainfall than adjacent lowlands.

The length of the rainy season varies chiefly with latitude: 5 months in Tripoli and Alexandria, 8 or 9 months on the southern Spanish, Algerian, Sicilian, and southern Greek Coasts, 11 months on the Mediterranean coasts of northern Spain and Italy and southern France. In the northern interior of Italy and the Adriatic, and in the Balkans, the rainfall is spread out over the entire year. In the southern and eastern portions of the Mediterranean, midwinter (December and January) has the greatest rainfall. In the northwestern portion, heaviest rainfall occurs early in the rainy season: October or November.

## Visibility

Visibility is excellent on all the Mediterranean coasts. Visibility in winter is better than 5 nautical miles about 75% of the time; between 2 to 5 miles most of the rest of the time; and under ½ mile less than 1 day per month, except at a few localities. (See map)

## Fog and Cloud

Fog, sufficient to reduce visibility below ½ mile, occurs on the average less than once during December in most localities, though in several northern districts

(Barcelona, Genoa, Salonika, and the northern Adriatic) the December occurrence is from 2 to 4 days. (See map of fog.) Cloudiness averages about 50% of sky covered in winter, but shows small regional differences, varying from less than 40% in north Africa and southern Spain to between 60 and 70% in the Balkans and the east coast of Italy.

Winds

Winds, like other weather elements, are highly variable in winter, and may blow from any direction as a storm advances. The most frequent winter winds usually have a westerly component: west along the Mediterranean coast of Africa; northwest along the northern coasts of the Mediterranean except where north or northeast winds from the cold interior prevail, as in the northern ends of the Ligurian, Adriatic, and Aegean Seas. Strong winds occur frequently with winter storms, though winds of gale velocity, where encountered at all, are registered only 2 or 3 times a month. In the upper air above the 6000 feet level, winds are prevailingly from the west and northwest, with somewhat higher velocities than at the surface though still seldom of gale force. (See wind maps.)

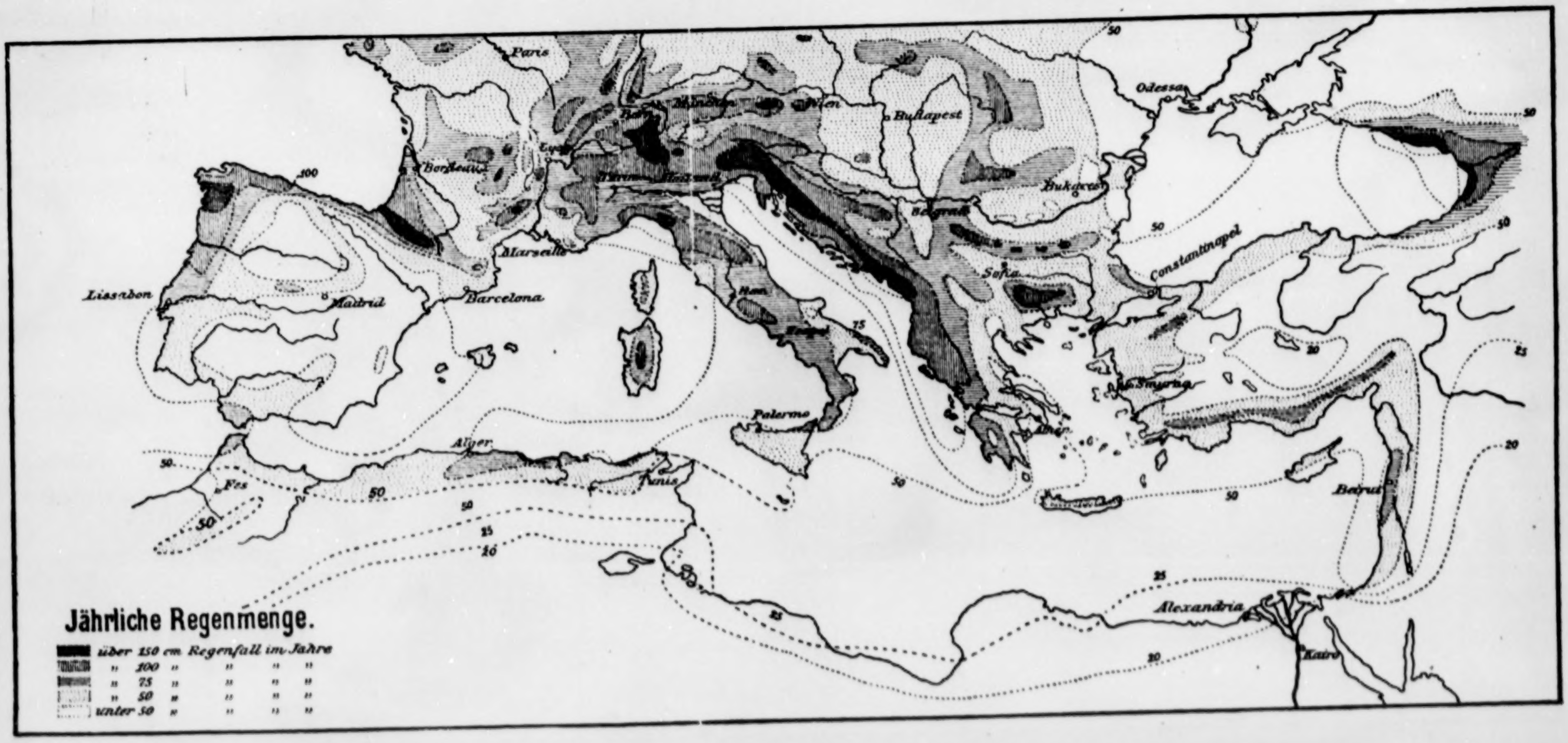
Heavy swell and rough sea, highly important in considerations of spot landings, often set in as much as a day ahead of the arrival of the wind that caused them, and may persist for a day after the wind has subsided. The frequency of swell varies greatly with local factors of exposure and underwater terrain at the individual coastal localities. The scattered localities for which records are available show heavy swell or rough sea from 1 to 9 days a month in winter on the south side of the Mediterranean, 1 to 13 on the north side.

## Snowfall

Snowfall is of no significance along the coasts. In the interior, however, it plays an important part in delaying or completely blocking road traffic and, in some areas, even railroad traffic. In the Alps and Pyrenees road travel is out of the question most of the winter, and roads across the mountains of Yugoslavia and Bulgaria are blocked with snow much of the time in winter.

## Summary

It is safe to say that even during the stormiest months of winter most days will be suitable for take off and landing operations by sea and air in the Mediterranean. Ground operations, however, will be hampered by mud about half the time on well-drained land, and even more on level lowlands. For aerial activity, planes based on southern and east-coast areas have more opportunities for operations than the stormier northern and west-coast areas, since weather at the base airdromes is the principal limiting atmospheric factor.



Jährliche Regenmenge.

über 150 cm Regenfall im Jahre
" 100 " " " "
" 75 " " " "
" 50 " " " "
unter 50 " " " "
Paris
Bordeaux
Lyon
Bern
München
Wien
Budapest
Odessa
Turin
Mailand
Marseille
Barcelona
Madrid
Lissabon
Rom
Neapel
Belgrad
Bukarest
Sofia
Constantinopel
Smyrna
Athen
Palermo
Alger
Tunis
Fes
Beirut
Alexandria
Kairo
100
75
50
25
26
20

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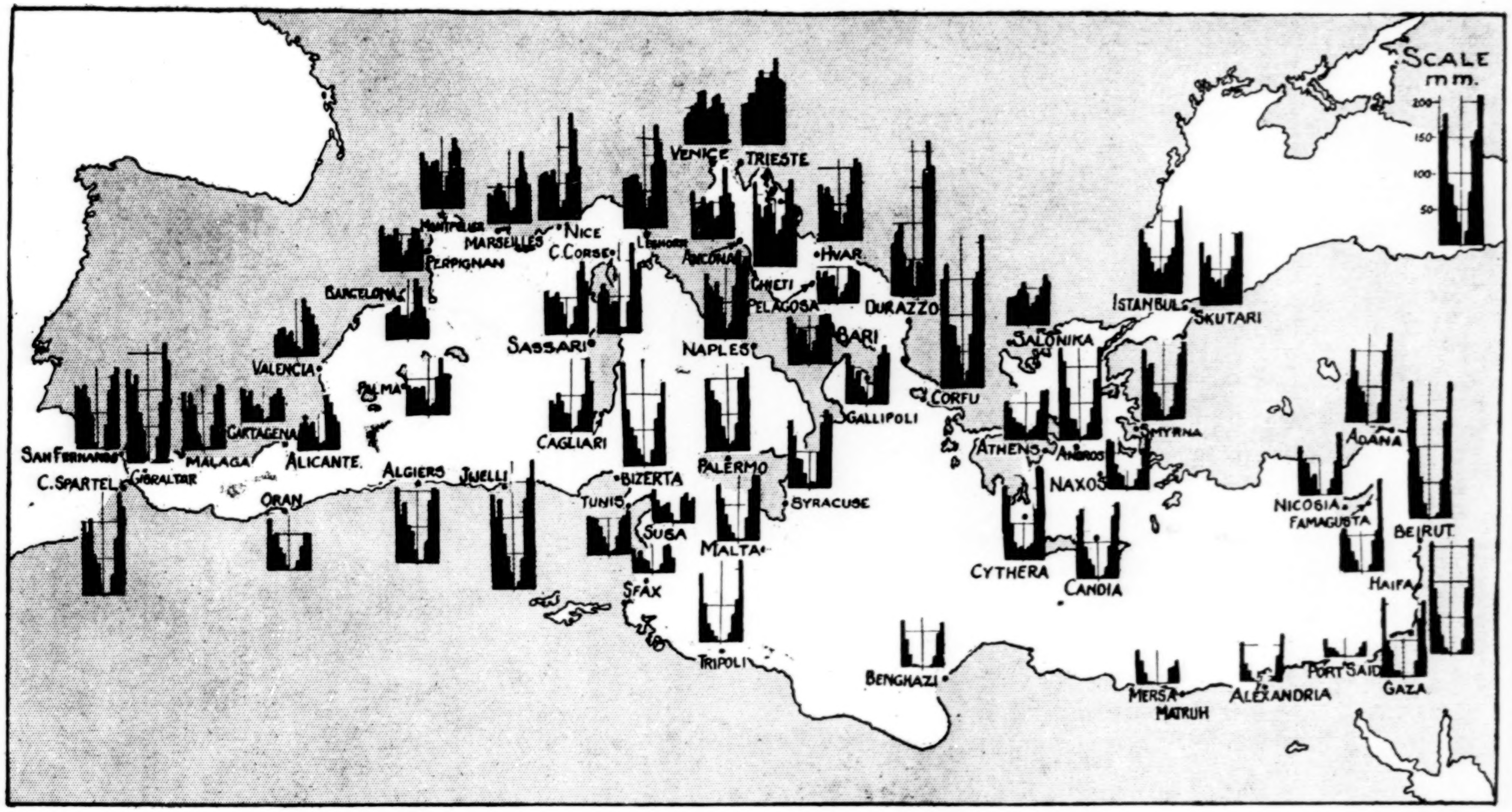
SCALE
mm.
200
150
100
50
SAN FERNANDO
C. SPARTEL
GIBRALTAR
MALAGA
CARTAGENA
ALICANTE
VALENCIA
BARCELONA
PALMA
ORAN
ALGIERS
DJIDJELLI
PERPIGNAN
MONTPELLIER
MARSEILLES
NICE
C. CORSE
SASSARI
CAGLIARI
LEGHORN
VENICE
TRIESTE
ANCONA
CHIETI
PELAGOSA
HVAR
NAPLES
BARI
DURAZZO
GALLIPOLI
CORFU
PALERMO
SYRACUSE
MALTA
TUNIS
BIZERTA
SUSA
SFAX
TRIPOLI
BENGHAZI
SALONIKA
ATHENS
ANDROS
NAXOS
CYTHERA
CANDIA
SMYRNA
ISTANBUL
SKUTARI
ADANA
NICOSIA
FAMAGUSTA
BEIRUT
HAIFA
GAZA
PORT SAID
ALEXANDRIA
MERSA MATRUH

Mean monthly rainfall (mm.)

Notes.—The periods differ from station to station, and differ also from those in the tables of Vol. II.
Square brackets indicate less than 5 years' observations.
Round brackets indicate 5 to 10 years' observations.

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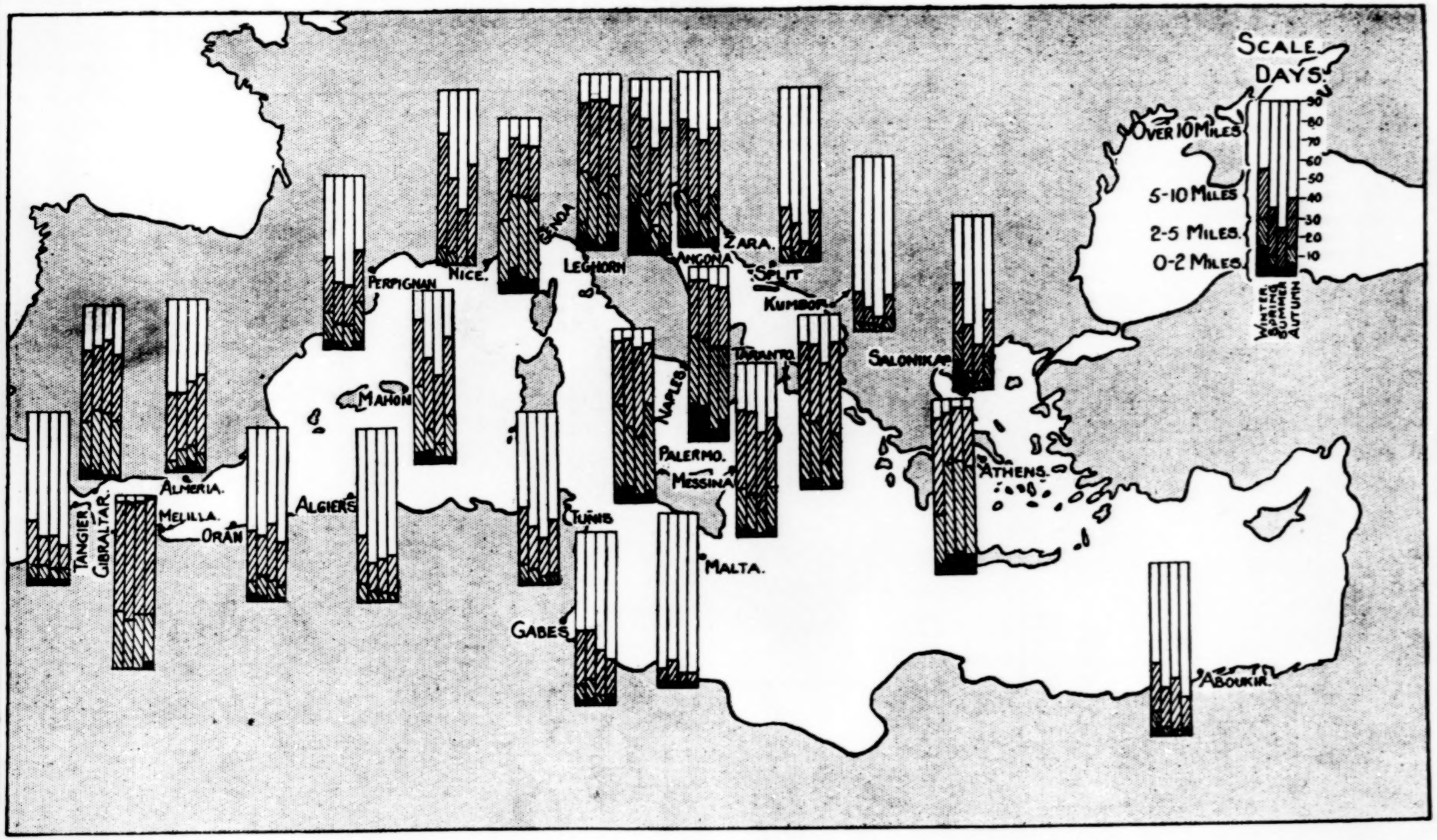
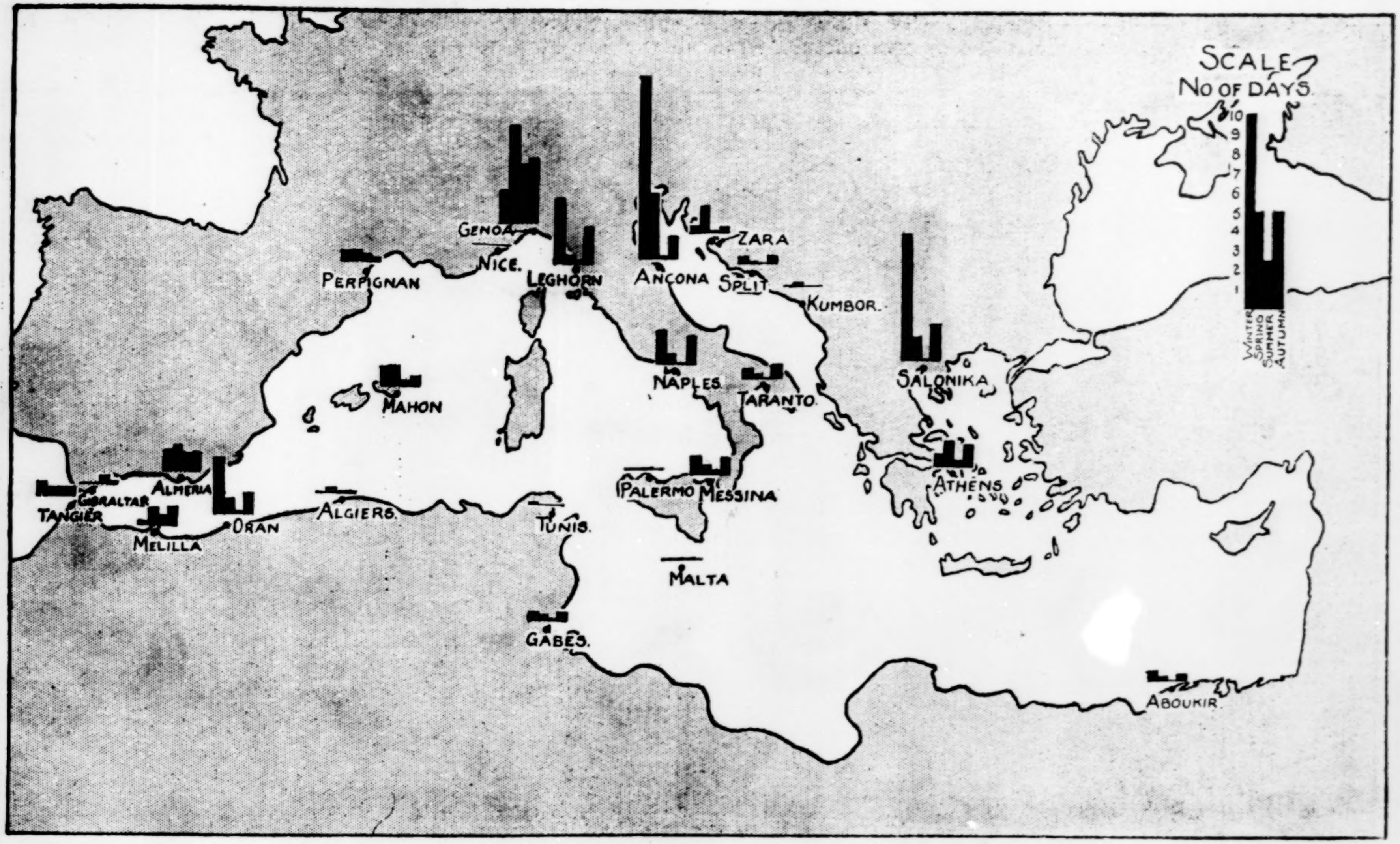

SCALE.
DAYS.
90
80
70
60
50
40
30
20
10
OVER 10 MILES.
5-10 MILES.
2-5 MILES.
0-2 MILES.
WINTER.
SPRING.
SUMMER.
AUTUMN.
TANGIER.
GIBRALTAR.
ALMERIA.
MELILLA.
ORAN.
ALGIERS.
MAHON.
PERPIGNAN.
NICE.
GENOA.
LEGHORN.
ANCONA.
ZARA.
SPLIT.
KUMBOR.
NAPLES.
PALERMO.
MESSINA.
TARANTO.
SALONIKA.
ATHENS.
TUNIS.
GABES.
MALTA.
ABOUKIR.

NUMBER OF DAYS PER SEASON WITH VARIOUS RANGES OF VISIBILITY.

Observations at most stations refer to morning, midday and evening; at Melilla, Almeria, Mahon refer to morning and evening; at Athens and Salonika to morning and midday.


SCALE
No OF DAYS
10
9
8
7
6
5
4
3
2
1
WINTER
SPRING
SUMMER
AUTUMN
GENOA
NICE.
PERPIGNAN
LEGHORN
ANCONA
ZARA
SPLIT
KUMBOR.
SALONIKA
NAPLES
TARANTO.
MAHON
ALMERIA
GIBRALTAR
TANGIER
MELILLA
ORAN
ALGIERS.
TUNIS.
PALERMO
MESSINA
ATHENS
MALTA
GABES.
ABOUKIR.

-Number of days per season with fog (visibility less than half a sea mile) at observation hours.
Observations at most stations refer to morning, midday and evening; at Melilla, Almeria, Mahon refer to morning and evening; at Athens and Salonika to morning and midday.

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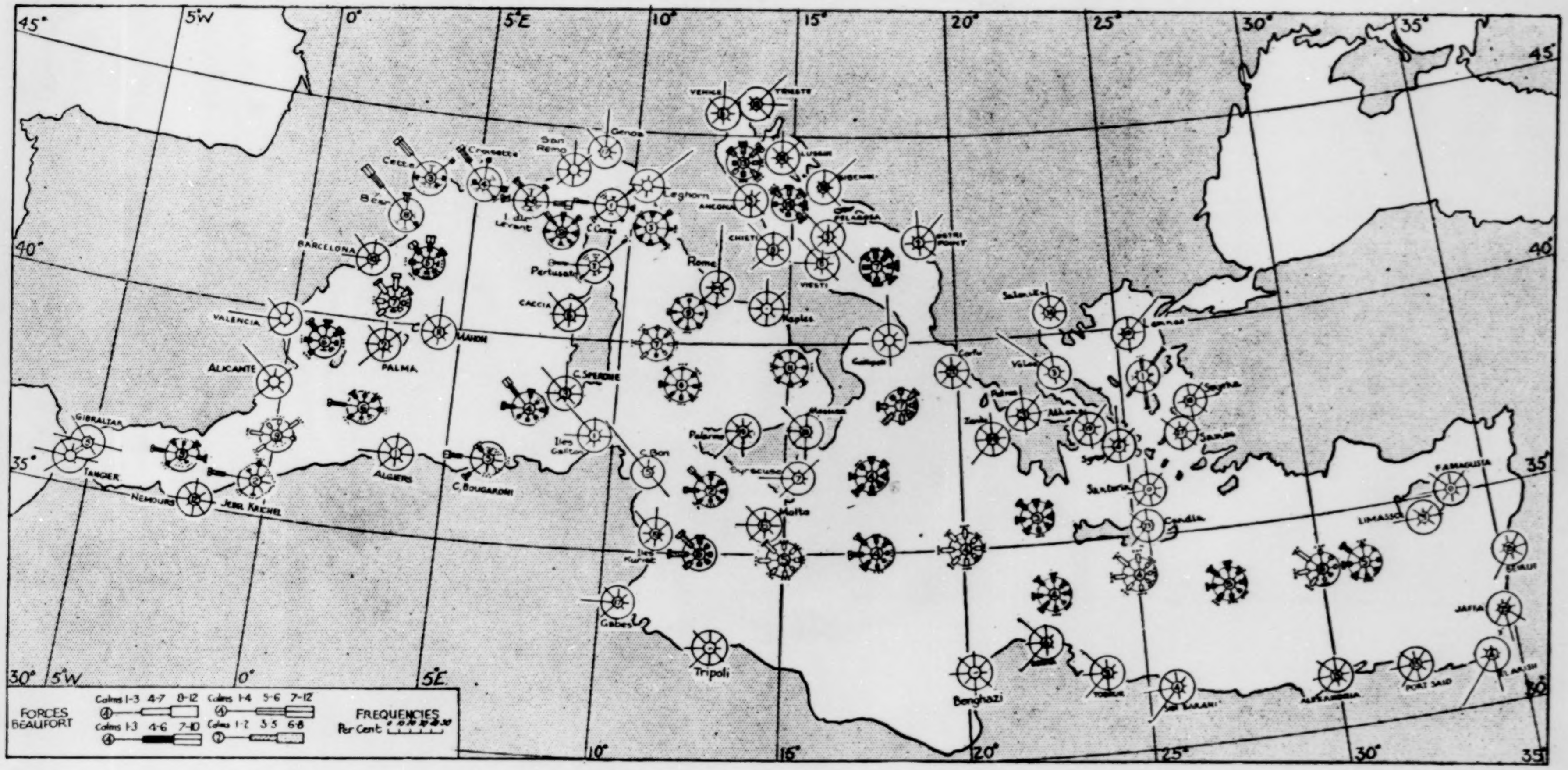
45°
5°W
0°
5°E
10°
15°
20°
25°
30°
35°
40°
VENICE
TRIESTE
Genoa
San Remo
Croisette
Cette
Bear
Leghorn
ANCONA
I. du Levant
C. Corse
BARCELONA
Pertusato
CACCIA
Rome
CHIETI
VIESTI
PELAGOSA
PETRI POINT
Naples
VALENCIA
MAHON
PALMA
ALICANTE
C. SPERONE
Iles Galiton
C. Bon
GIBRALTAR
TANGIER
NEMOURS
JEBEL KRICHEL
ALGIERS
C. BOUGAROUN
Palermo
Messina
Syracuse
Malta
Iles Kuriat
Gabes
Tripoli
Benghazi
Salonika
Lemnos
Corfu
Volo
Patras
Zante
Athens
Syra
Smyrna
Samos
Santorin
Candia
FAMAGUSTA
LIMASSOL
BEIRUT
JAFFA
EL ARISH
PORT SAID
ALEXANDRIA
SIDI BARRANI
TOBRUK
FORCES BEAUFORT
Calms 1-3 4-7 8-12
Calms 1-4 5-6 7-12
Calms 1-3 4-6 7-10
Calms 1-2 3-5 6-8
FREQUENCIES
Per Cent

SURFACE WINDS—WINTER.

NOTES.—The distance between the inner and outer circles of the wind roses represents 10 per cent.
On most of the roses for land stations the direction only is indicated, not the force.
On the roses, dots indicate frequencies of less than 1 per cent. of the various forces.
For details of the areas covered by the roses over the sea, *see* Vol. II.

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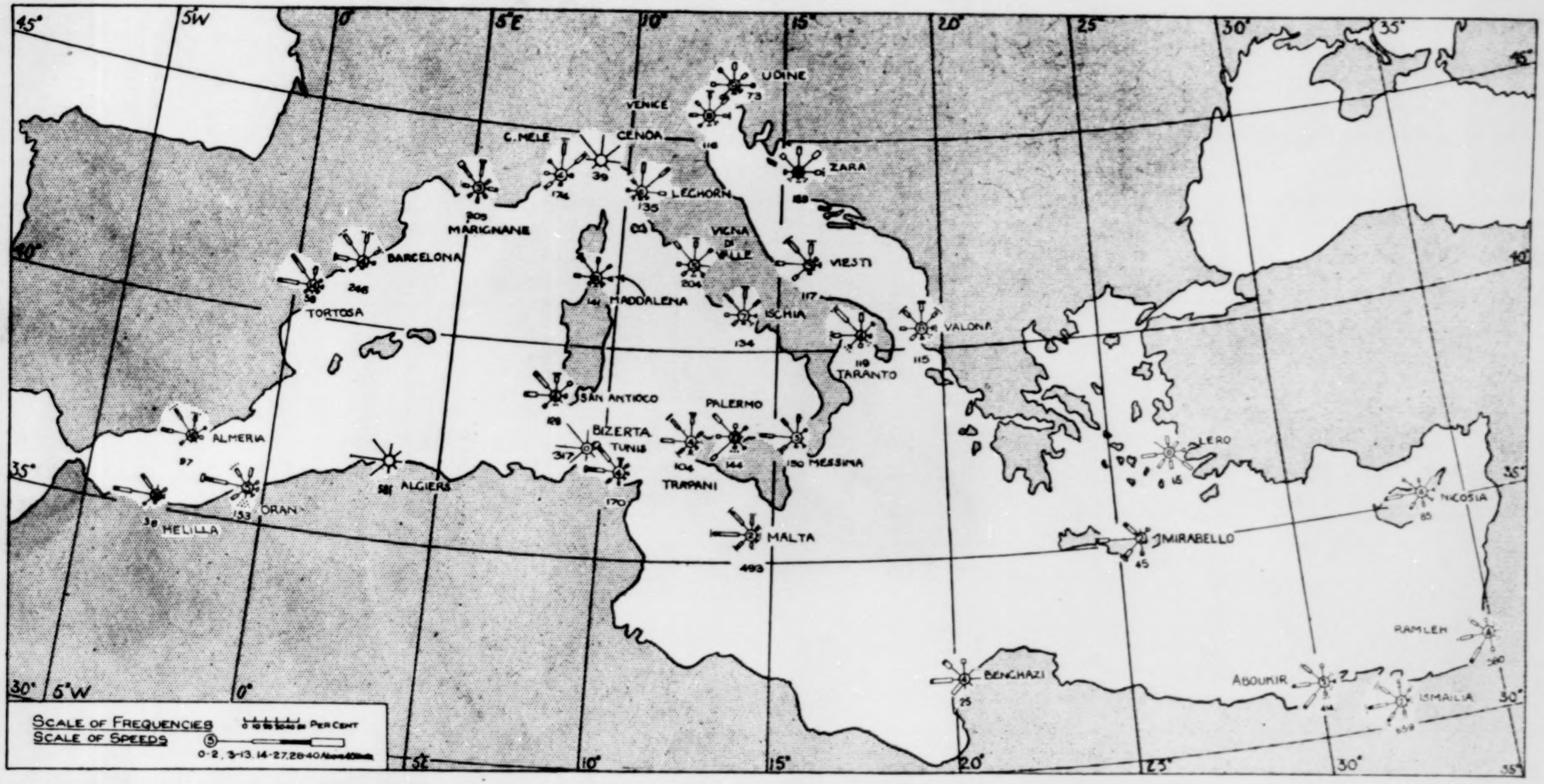
45°
5W
0°
5°E
10°
15°
20°
25°
30°
35°
40°
UDINE
73
VENICE
118
C. MELE
GENOA
39
174
LEGHORN
135
ZARA
MARIGNANE
305
BARCELONA
248
TORTOSA
38
MADDALENA
141
VIGNA DI VALLE
204
VIESTI
117
ISCHIA
134
TARANTO
110
VALONA
115
SAN ANTIOCO
128
BIZERTA
TUNIS
317
170
PALERMO
144
TRAPANI
104
MESSINA
130
ALMERIA
97
ALGIERS
581
ORAN
133
MELILLA
30
MALTA
493
LERO
18
MIRABELLO
45
NICOSIA
85
RAMLEH
280
ABOUKIR
ISMAILIA
BENGHAZI
25
SCALE OF FREQUENCIES
PER CENT
SCALE OF SPEEDS
0-2, 3-13, 14-27, 28-40, Above 40 m.p.h.

UPPER WIND—WINTER—6,000 FT.

NOTES.—The dots on the wind roses indicate frequencies of less than 1 per cent. of the different speeds.
Figures below the roses give the number of observations.
The roses for Genoa, Algiers, Bizerta indicate the direction only, not the speed.
The roses for Tortosa, Benghazi, Lero are based on data for January only.

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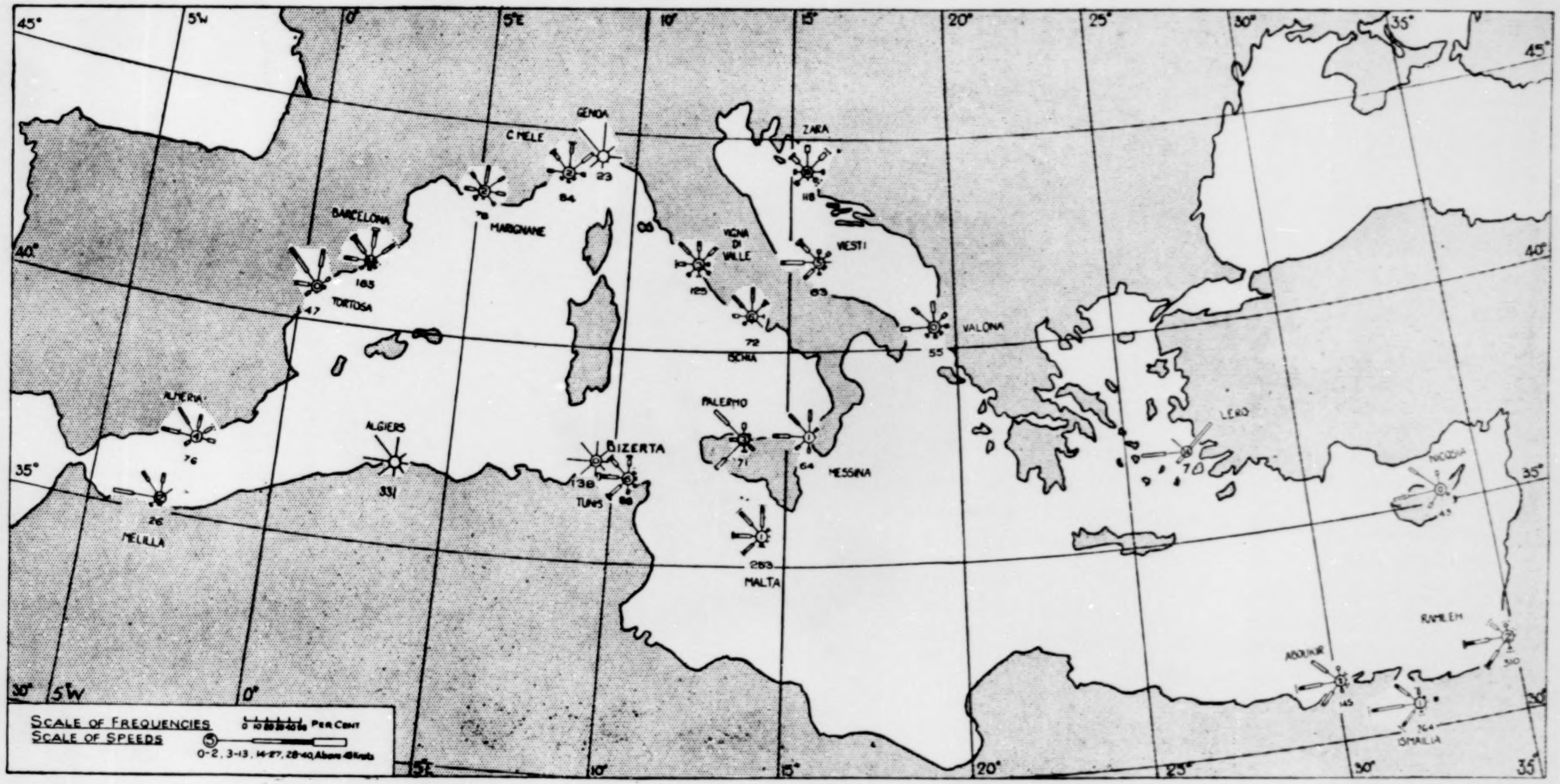
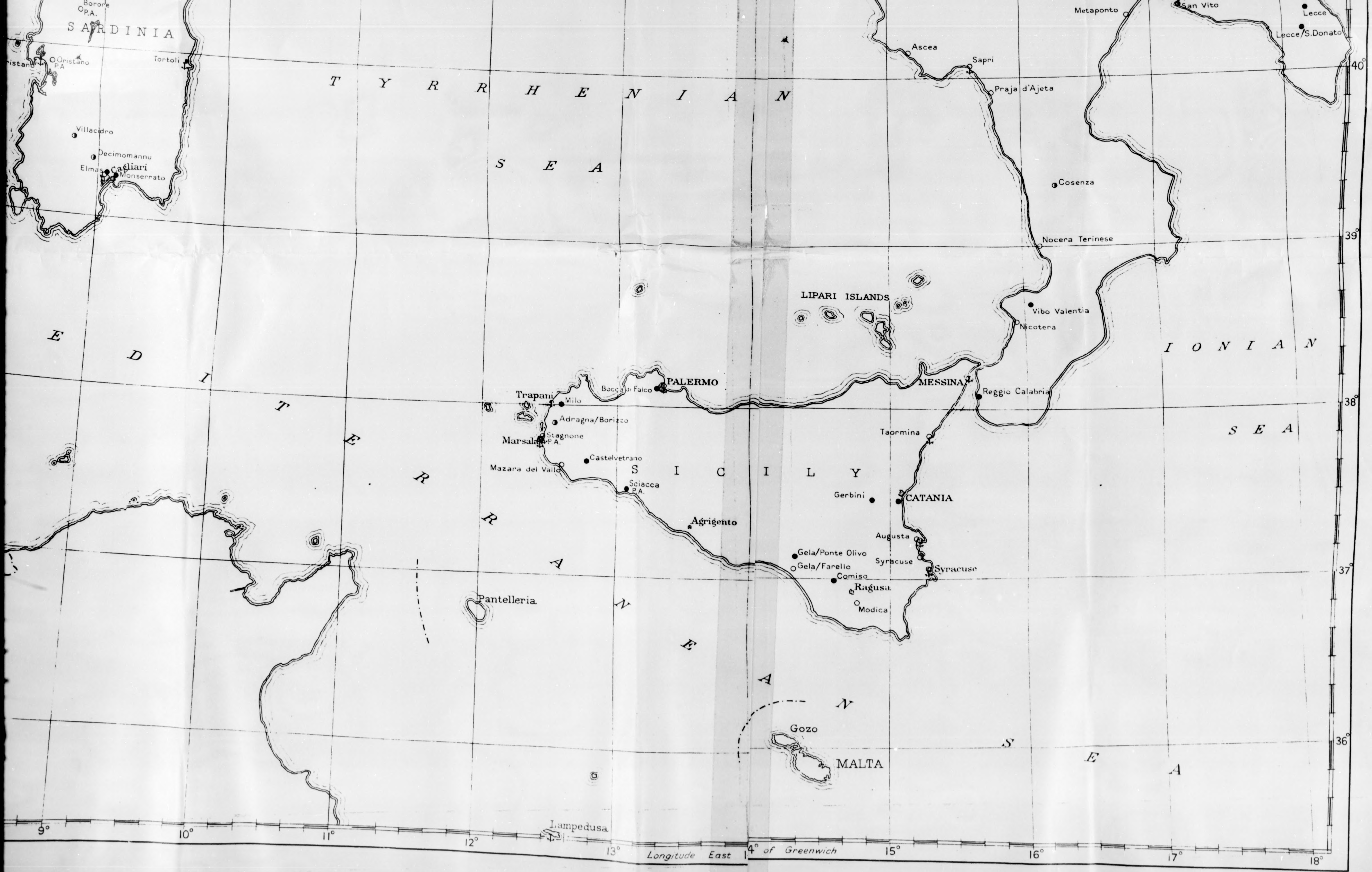

GENOA
23
C. MELE
84
78
MARIGNANE
BARCELONA
183
TORTOSA
47
ALMERIA
76
MELILLA
26
ALGIERS
331
BIZERTA
138
TUNIS
ZARA
118
VIESTI
83
VIGNA DI VALLE
ISCHIA
72
VALONA
55
PALERMO
71
MESSINA
64
MALTA
283
LERO
70
NICOSIA
RAMLEH
310
ABOUKIR
145
SCALE OF FREQUENCIES
0 10 20 30 40 50 PER CENT
SCALE OF SPEEDS
0-2, 3-13, 14-27, 28-40, Above 40 Knots
45°
40°
35°
30°
5°W
0°
5°E
10°
15°
20°
25°
30°
35°

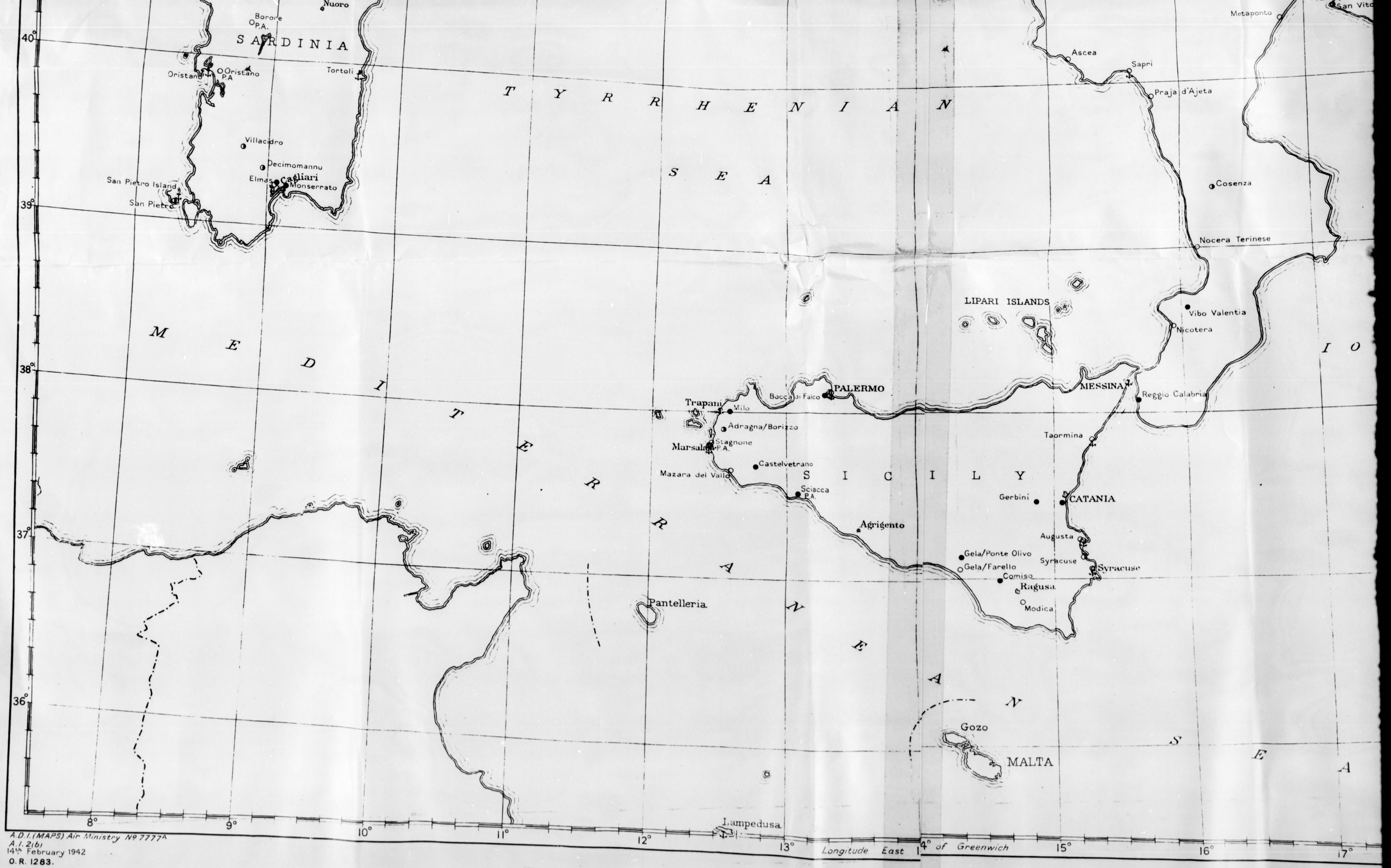
UPPER WIND—WINTER—10,000 FT.

NOTES.—The dots on the wind roses indicate frequencies of less than 1 per cent. of the different speeds.
Figures below the roses give the number of observations.
The roses for Genoa, Algiers, Bizerta indicate the direction only, not the speed.
The roses for Tortosa and Lero are based on data for January only.

Due to its large size, the following document has been filmed in segments. The order of the segments is as follows: left to right, top to bottom.


SARDINIA
Borore
O.P.A.
Oristano
O.Oristano P.A.
Tortoli
Villacidro
Decimomannu
Elmas
Cagliari
Monserrato
TYRRHENIAN
SEA
MEDITERRANEAN
SEA
Ascea
Sapri
Praja d'Ajeta
Metaponto
San Vito
Lecce
Lecce/S.Donato
Cosenza
Nocera Terinese
LIPARI ISLANDS
Vibo Valentia
Nicotera
IONIAN
SEA
PALERMO
Bocca di Falco
Trapani
Milo
Adragna/Borizzo
Stagnone
Marsala
P.A.
Castelvetrano
Mazara del Vallo
SICILY
Sciacca
P.A.
Agrigento
MESSINA
Reggio Calabria
Taormina
Gerbini
CATANIA
Augusta
Gela/Ponte Olivo
Gela/Farello
Syracuse
Syracuse
Comiso
Ragusa
Modica
Pantelleria
Gozo
MALTA
Lampedusa
9°
10°
11°
12°
13°
Longitude East 14° of Greenwich
15°
16°
17°
18°
36°
37°
38°
39°
40°

W.O. 1942.


Nuoro
Borore
O.P.A.
SARDINIA
Oristano
Oristano P.A.
Tortoli
Villacidro
Decimomannu
San Pietro Island
San Pietro
Elmas
Cagliari
Monserrato
T Y R R H E N I A N
S E A
M E D I T E R R A N E A N
S E A
I O
Metaponto
San Vito
Ascea
Sapri
Praja d'Ajeta
Cosenza
Nocera Terinese
LIPARI ISLANDS
Vibo Valentia
Nicotera
MESSINA
Reggio Calabria
Trapani
Milo
Bocca di Falco
PALERMO
Adragna/Borizzo
Marsala
Stagnone
P.A.
Castelvetrano
Mazara del Vallo
S I C I L Y
Sciacca
P.A.
Taormina
Gerbini
CATANIA
Agrigento
Augusta
Gela/Ponte Olivo
Gela/Farello
Syracuse
Syracuse
Comiso
Ragusa
Modica
Pantelleria
Gozo
MALTA
Lampedusa
40°
39°
38°
37°
36°
8°
9°
10°
11°
12°
13°
14° of Greenwich
Longitude East
15°
16°
17°

A.D.I.(MAPS) Air Ministry No 7777A
A.I.2(b)
14th February 1942
O.R. 1283.

allo
Sampierdarena
GENOA
Varazza
Ligure
Gallinaria Island
Spezia
Cadimare
Muggiano
Sarzana
Palmaria Island
Borgo Val di Taro
Modena
BOLOGNA
Pavullo
Lugo
Marina di Ravenna
Ravenna
Forli
Rimini
Pistoia
Lucca
Torre del Lago
Peretola
Campo di Marte
Pisa
San Giusto
R. Arno
FIRENZE
Marina di Pisa
Pontedera
LIVORNO
Fano
Falconara
Ancona
Iesi
Loreto
Arezzo
Siena/Pian del Lago
Siena/Malignano
Cecina
IAN SEA
Passignano
Castiglione
L. Trasimeno
Perugia
Macerata
Fermo
Campiglia/Venturina
Foligno
Tortoreto
Grosseto
Orvieto
Spoleto
L. Bolsena
R. Tiber
Terni
Albinia
Orbetello
Rieti
Pescara
Viterbo
Stimigliano
Aquila
Bastia
Borgo
P.A.(North)
(West) P.A.
Fiume Secco
Santa Catterina
P.A. (East)
P.A. Poretta (South)
P.A. Folelli
CORSICA
Aghione P.A.
Tarquinia
Bracciano
L. Bracciano
Vigne di Valle
Marcigliana
Guidonia
Avezzano
Mezzana P.A.
Casabnda P.A.
Aspretto
Campo del Oro
Ajaccio
Ghisonaco P.A.
Furbara
Cerveteri
ROME
Littorio
Centocelle
Magliana
Ciampino
Lida di Roma
Propriano P.A.
Ponte di Rizzanese P.A.
Porto Vecchio P.A.
Sappa P.A.
R. Sacco
Frosinone
Cisterna
Cisterna/Littoria
Isoletta
Aquino
Littoria
R. Liri
Nettuno
Paola Lake
Terracina
Sessa Aurunca
Maddalena Island
Caprera Island
Gaeta/Porto Salvo
Capua
Benevento
Ariano
Bovino
Foggia
Varano
Bari
Tempio
Olbia
Cancello P.A.
Pomigliano D'Arco
Capodichino
Lago di Patria
Nisida
NAPLES
Palazzo
Gioia del Colle
Campo Casale
S. Vito de' Normanni
Brindisi
Sassari
Coghinas
illa
ghero
Castellammare
Salerno
Monte Corvino
Taranto
Grottaglie
San Vito
Lecce
Metaponto
Lecce/S.Donato
Nuoro
Borore P.A.
SARDINIA
Ascea
Sapri
Tortoli
Oristano P.A.
TYRRHENIAN SEA
Praja d'Ajeta
Villacidro
Decimomannu
Elmas
Cagliari
Monserrato
Cosenza
Lussin Piccoli
Zara
ADRIATIC SEA
Lagosta/Porto Lago
44°
43°
42°
41°
40°
39°

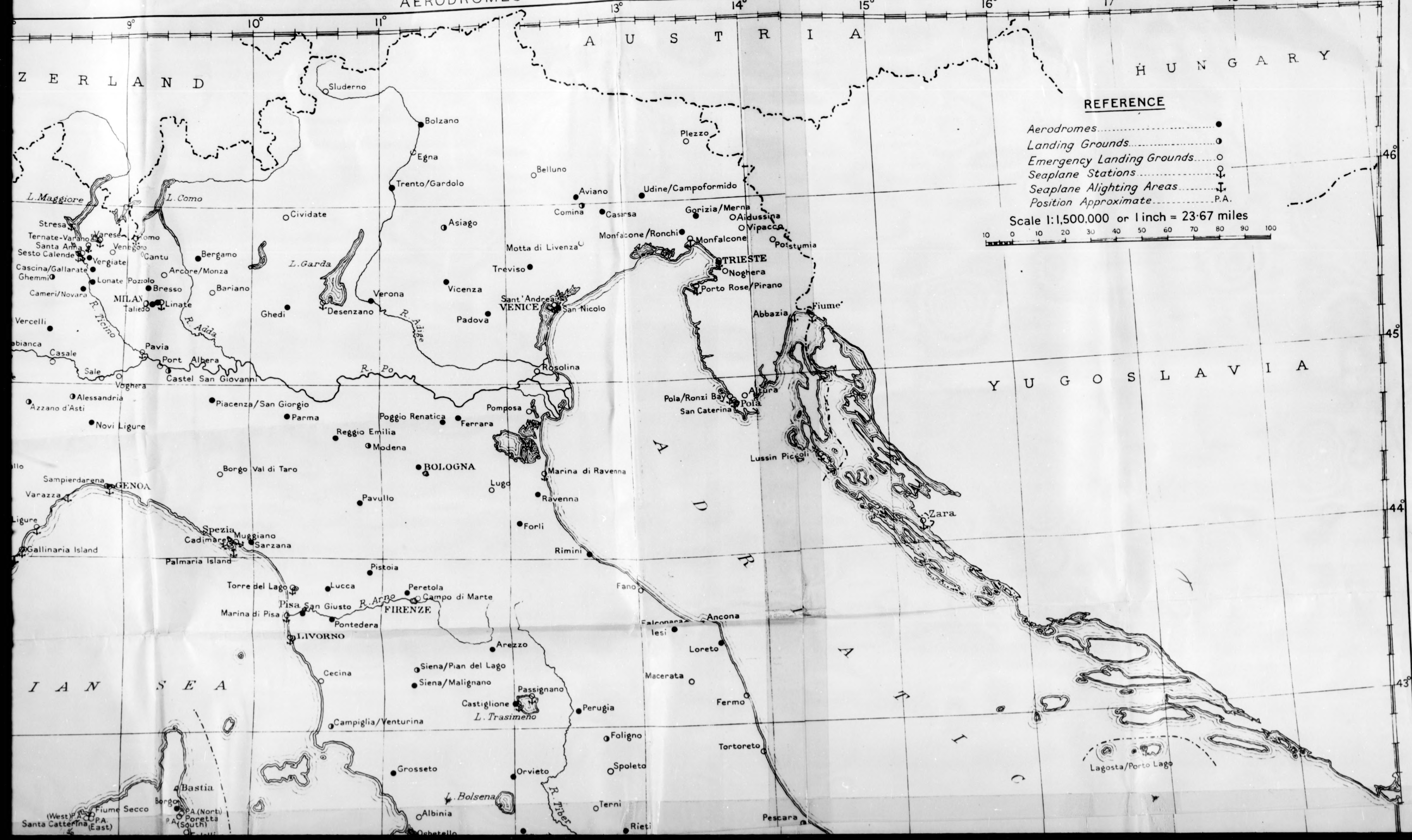
LIGURIAN SEA
TYRRHENIAN SEA
ADRIATIC SEA
CORSICA
SARDINIA
44°
43°
42°
41°
40°
39°
Saluzzo
Levaldigi/Centallo
Mondovi
Sampierdarena
GENOA
Varazza
Finale Ligure
Villanova/Albenga
Gallinaria Island
Alassio
San Remo
Spezia
Cadimare
Muggiano
Sarzana
Palmaria Island
Torre del Lago
Lucca
Pistoia
Peretola
Campo di Marte
R. Arno
FIRENZE
Pisa
San Giusto
Marina di Pisa
Pontedera
LIVORNO
Reggio Emilia
Modena
Borgo Val di Taro
BOLOGNA
Pavullo
Lugo
Marina di Ravenna
Ravenna
Forli
Rimini
Fano
Lussin Piccolo
Zara
Falconara
Ancona
Iesi
Loreto
Macerata
Fermo
Tortoreto
Lagosta/Porto Lago
Pescara
Arezzo
Siena/Pian del Lago
Siena/Malignano
Cecina
Passignano
Castiglione
L. Trasimeno
Perugia
Campiglia/Venturina
Foligno
Spoleto
Grosseto
Orvieto
R. Tiber
L. Bolsena
Terni
Albinia
Orbetello
Viterbo
Rieti
Aquila
Stimigiano
Tarquinia
L. Bracciano
Bracciano
Vigne di Valle
Marcigliana
Guidonia
Avezzano
Furbara
Cerveteri
ROME
Littorio
Centocelle
Magliana
Ciampino
Lida di Roma
R. Sacco
Frosinone
Cisterna
Cisterna/Littoria
Littoria
Isoletta
Aquino
R. Liri
Nettuno
Paola Lake
Terracina
Gaeta/Porto Salvo
Sessa Aurunca
Capua
Benevento
Ariano
Bovino
Foggia
Varano
Bari
Palazzo
Cancello
P.A.
Pomigliano D'Arco
Capodichino
Lago di Patria
Nisida
NAPLES
Castellammare
Salerno
Monte Corvino
Gioia del Colle
S. Vito de
Taranto
San Vi
Metaponto
Ascea
Sapri
Praja d'Ajeta
Cosenza
Nocera Terinese
Bastia
Borgo
P.A. (North)
Poretta
P.A. (South)
P.A.
Folelli
(West) P.A.
Fiume Secco
Santa Catterina
P.A. (East)
Aghione
P.A.
Casabanda
P.A.
Mezzana
P.A.
Ghisonaccia
P.A.
Aspretto
Ajaccio
Campo del Oro
P.A.
Propriano
Ponte di Rizzanese
P.A.
Porto Vecchio
P.A.
Sappa
P.A.
Maddalena Island
Caprera Island
Tempio
Olbia
Sassari
Coghinas
Fertilia
Porto Conte
Alghero
Nuoro
Borore
P.A.
Oristano
Oristano
P.A.
Tortoli
Villacidro
Decimomannu
Elmas
Cagliari
Monserrato
San Pietro Island
San Pietro
F
R

CLASSIFICATION Changed to UNCLASSIFIED

~~SECRET~~

# ITALY

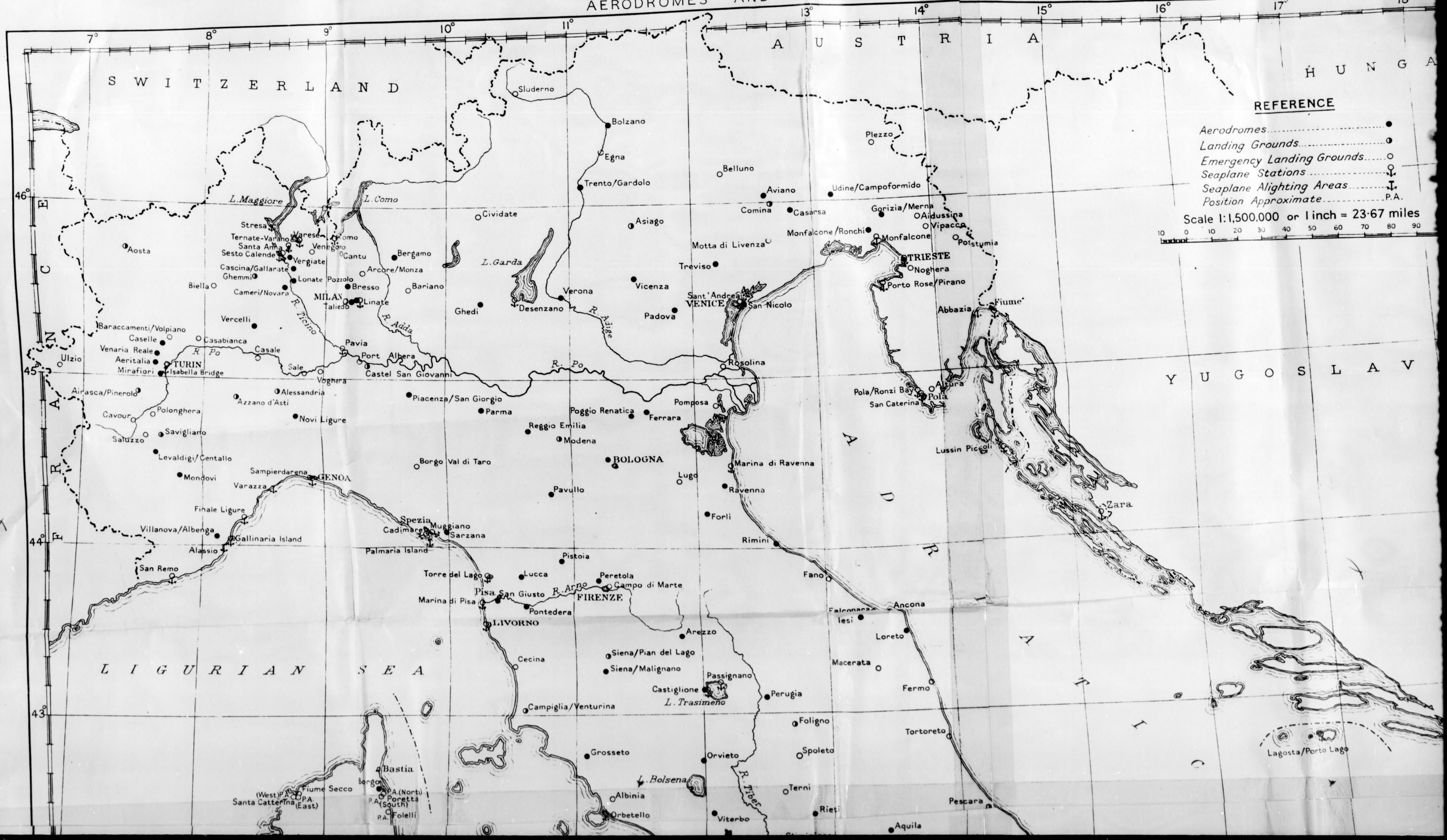
## AERODROMES AND LANDING GROUNDS



REFERENCE
Aerodromes ●
Landing Grounds ◐
Emergency Landing Grounds ○
Seaplane Stations
Seaplane Alighting Areas
Position Approximate P.A.
Scale 1:1,500,000 or 1 inch = 23·67 miles
10 0 10 20 30 40 50 60 70 80 90 100
9° 10° 11° 13° 14° 15° 16° 17° 18° 19°
43° 44° 45° 46°
AUSTRIA
HUNGARY
ZERLAND
YUGOSLAVIA
ADRIATIC
IAN SEA
Sluderno
Bolzano
Egna
Trento/Gardolo
Belluno
Plezzo
Aviano
Comina
Casarsa
Udine/Campoformido
Gorizia/Merna
Aidussina
Vipacco
Postumia
Monfalcone/Ronchi
Monfalcone
TRIESTE
Noghera
Porto Rose/Pirano
Fiume
Abbazia
Motta di Livenza
Treviso
Asiago
Vicenza
Padova
Sant' Andrea
VENICE
San Nicolo
Cividate
L. Maggiore
L. Como
L. Garda
Stresa
Ternate-Varano
Varese
Como
Venegono
Santa Anna
Sesto Calende
Vergiate
Cantu
Bergamo
Cascina/Gallarate
Ghemmi
Lonate Pozzolo
Arcore/Monza
Bariano
Cameri/Novara
MILAN
Bresso
Taliedo
Linate
Ghedi
Desenzano
Verona
R. Adige
R. Adda
R. Ticino
R. Po
Vercelli
abianca
Casale
Pavia
Port Albera
Sale
Voghera
Castel San Giovanni
Rosolina
Alessandria
Azzano d'Asti
Piacenza/San Giorgio
Parma
Novi Ligure
Poggio Renatica
Ferrara
Pomposa
Reggio Emilia
Modena
BOLOGNA
Borgo Val di Taro
Marina di Ravenna
Lugo
Ravenna
Pavullo
Forli
Rimini
Pola/Ronzi Bay
San Caterina
Altura
Pola
Lussin Piccoli
Zara
Sampierdarena
GENOA
Varazza
Ligure
Spezia
Muggiano
Cadimare
Sarzana
Gallinaria Island
Palmaria Island
Pistoia
Torre del Lago
Lucca
Peretola
Campo di Marte
Pisa
San Giusto
R. Arno
FIRENZE
Marina di Pisa
Pontedera
LIVORNO
Fano
Falconara
Iesi
Ancona
Loreto
Arezzo
Siena/Pian del Lago
Siena/Malignano
Cecina
Macerata
Passignano
Castiglione
L. Trasimeno
Perugia
Fermo
Campiglia/Venturina
Foligno
Tortoreto
Grosseto
Orvieto
Spoleto
Lagosta/Porto Lago
Bastia
L. Bolsena
R. Tiber
Borgo
P.A. (North)
(West) P.A.
Fiume Secco
P.A. Poretta (South)
Santa Catterina P.A. (East)
Albinia
Terni
Orbetello
Rieti
Pescara

# ITALY

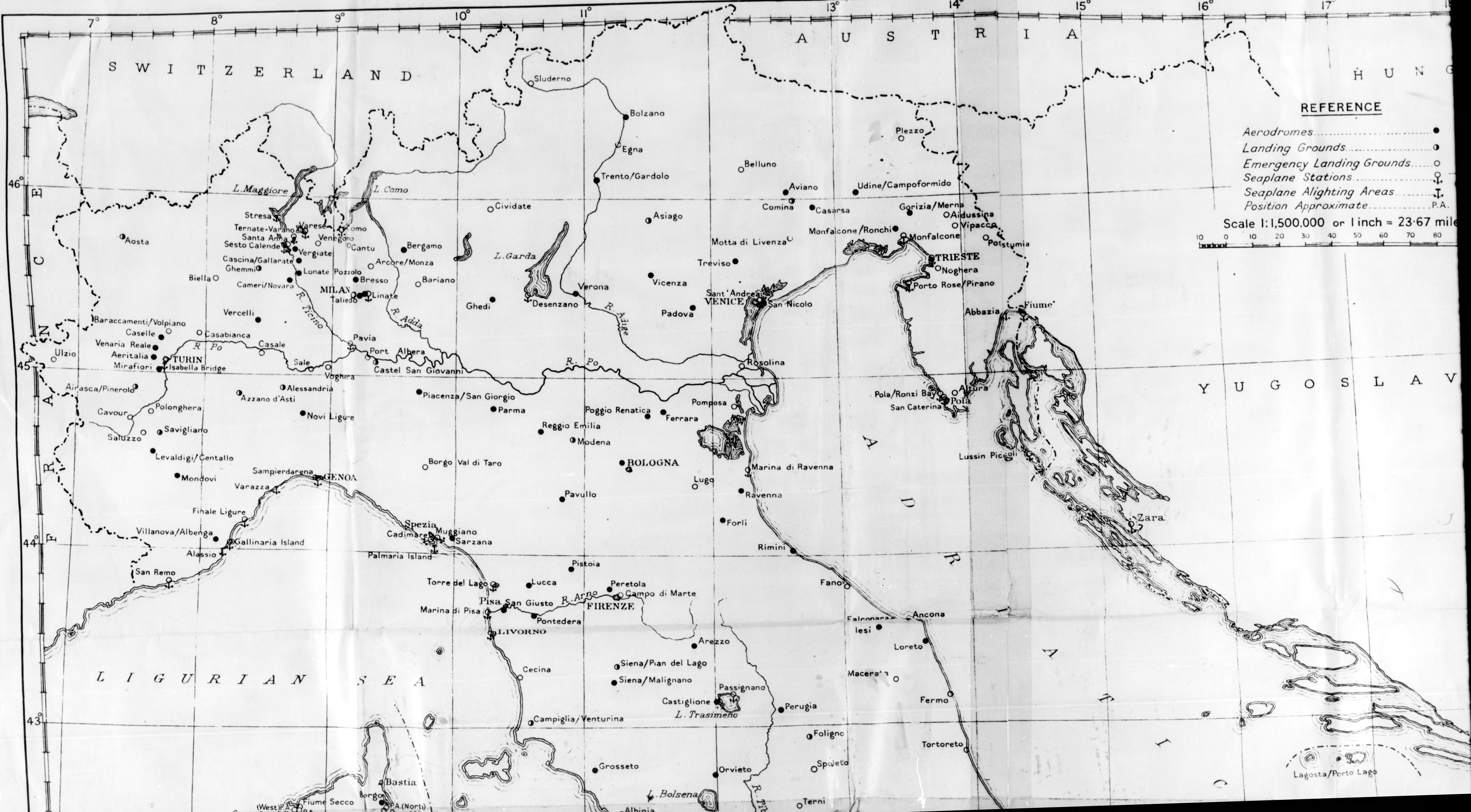
## AERODROMES AND LANDING GROUNDS



REFERENCE
Aerodromes ●
Landing Grounds ◑
Emergency Landing Grounds ○
Seaplane Stations
Seaplane Alighting Areas
Position Approximate P.A.
Scale 1:1,500,000 or 1 inch = 23·67 miles
10 0 10 20 30 40 50 60 70 80 90
7° 8° 9° 10° 11° 13° 14° 15° 16° 17° 18°
46° 45° 44° 43°
SWITZERLAND
AUSTRIA
HUNGA
FRANCE
YUGOSLAV
ADRIATIC
LIGURIAN SEA
Sluderno
Bolzano
Egna
Trento/Gardolo
Belluno
Plezzo
Aviano
Comina
Casarsa
Udine/Campoformido
Gorizia/Merna
Aidussina
Vipacco
Postumia
Asiago
Cividate
L. Maggiore
L. Como
L. Garda
Stresa
Ternate-Varano
Varese
Como
Venegono
Cantu
Santa Anna
Sesto Calende
Vergiate
Cascina/Gallarate
Ghemmi
Lonate Pozzolo
Bresso
Arcore/Monza
Bergamo
Bariano
Cameri/Novara
Biella
Aosta
MILAN
Taliedo
Linate
R. Ticino
R. Adda
Ghedi
Desenzano
Verona
R. Adige
Vicenza
Padova
Treviso
Motta di Livenza
Monfalcone/Ronchi
Monfalcone
TRIESTE
Noghera
Porto Rose/Pirano
Abbazia
Fiume
Sant' Andrea
VENICE
San Nicolo
Vercelli
Baraccamenti/Volpiano
Caselle
Casabianca
Venaria Reale
Aeritalia
TURIN
Mirafiori
Isabella Bridge
Ulzio
R. Po
Casale
Pavia
Port Albera
Sale
Voghera
Castel San Giovanni
Rosolina
Airasca/Pinerolo
Alessandria
Azzano d'Asti
Piacenza/San Giorgio
Parma
Poggio Renatica
Ferrara
Pomposa
Cavour
Polonghera
Savigliano
Saluzzo
Novi Ligure
Reggio Emilia
Modena
BOLOGNA
Levaldigi/Centallo
Borgo Val di Taro
Marina di Ravenna
Mondovi
Sampierdarena
GENOA
Varazza
Pavullo
Lugo
Ravenna
Forli
Finale Ligure
Villanova/Albenga
Gallinaria Island
Alassio
San Remo
Spezia
Cadimare
Muggiano
Sarzana
Palmaria Island
Rimini
Pistoia
Torre del Lago
Lucca
Peretola
Campo di Marte
Pisa
San Giusto
R. Arno
FIRENZE
Marina di Pisa
Pontedera
LIVORNO
Fano
Ancona
Falconara
Iesi
Loreto
Arezzo
Siena/Pian del Lago
Siena/Malignano
Cecina
Macerata
Passignano
Castiglione
L. Trasimeno
Perugia
Fermo
Campiglia/Venturina
Foligno
Tortoreto
Grosseto
Orvieto
Spoleto
L. Bolsena
Bastia
Borgo
(West) P.A.
Fiume Secco
Santa Catterina
P.A. (East)
P.A. (North)
P.A. Poretta (South)
P.A. Folelli
Albinia
Orbetello
Terni
Rieti
Viterbo
R. Tiber
Pescara
Aquila
Lagosta/Porto Lago
Pola/Ronzi Bay
Altura
San Caterina
Pola
Lussin Piccoli
Zara

# ITALY

## AERODROMES AND LANDING GROUNDS

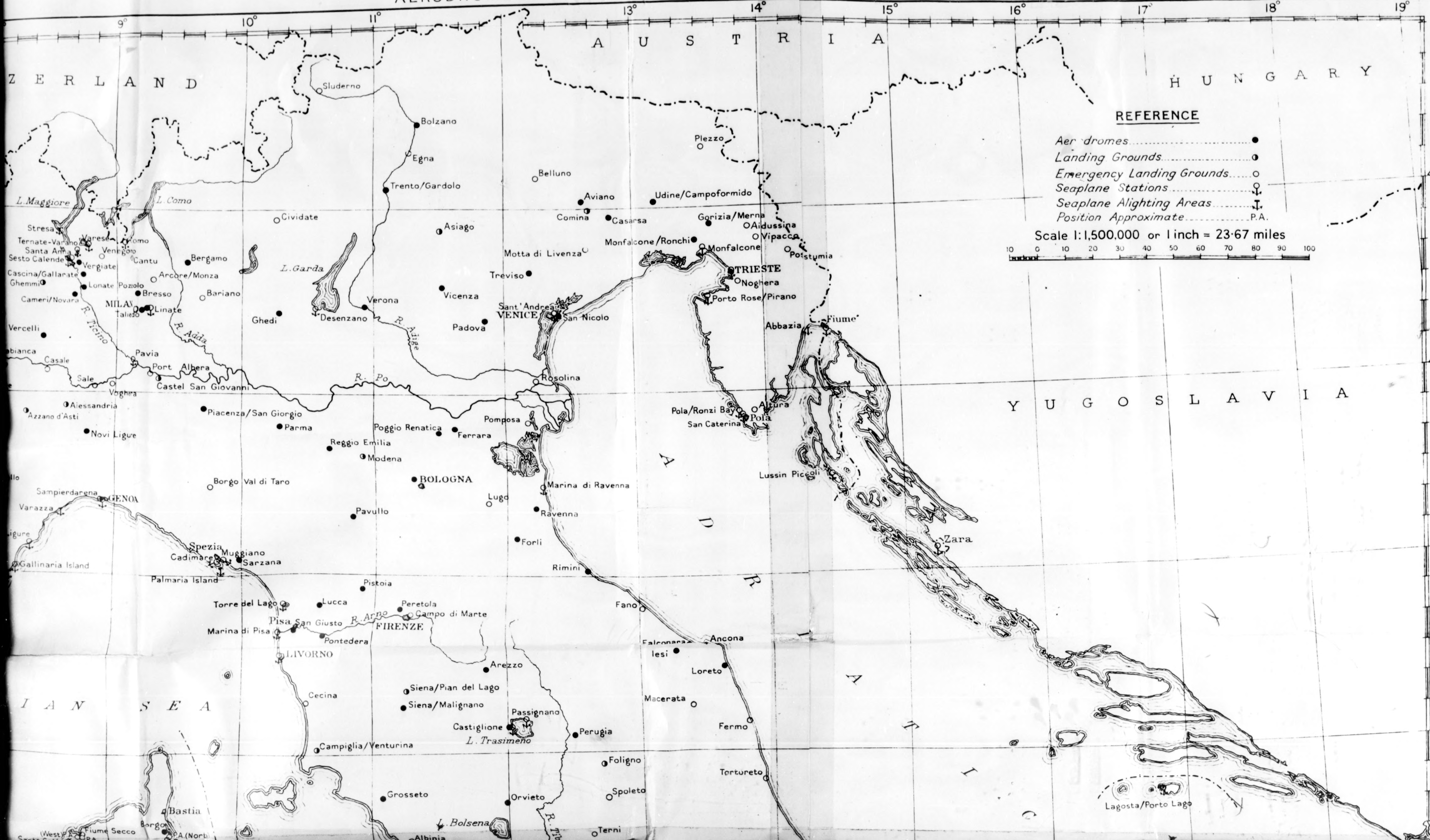

7°
8°
9°
10°
11°
13°
14°
15°
16°
17°
46°
45°
44°
43°
SWITZERLAND
AUSTRIA
HUNG
FRANCE
YUGOSLAV
LIGURIAN SEA
ADRIATIC
REFERENCE
Aerodromes ●
Landing Grounds ◑
Emergency Landing Grounds ○
Seaplane Stations
Seaplane Alighting Areas
Position Approximate P.A.
Scale 1:1,500,000 or 1 inch = 23·67 mile
10 0 10 20 30 40 50 60 70 80
Sluderno
Bolzano
Egna
Trento/Gardolo
Belluno
Plezzo
Aviano
Udine/Campoformido
Comina
Casarsa
Gorizia/Merna
Aidussina
Vipacco
Monfalcone/Ronchi
Monfalcone
Postumia
TRIESTE
Noghera
Porto Rose/Pirano
Abbazia
Fiume
Cividate
Asiago
Motta di Livenza
Treviso
Vicenza
Sant' Andrea
VENICE
San Nicolo
Padova
L. Maggiore
L. Como
L. Garda
Stresa
Ternate-Varano
Varese
Como
Santa Anna
Venegono
Sesto Calende
Vergiate
Cantu
Cascina/Gallarate
Ghemmi
Lonate Pozzolo
Arcore/Monza
Bergamo
Biella
Cameri/Novara
Bresso
Bariano
MILAN
Taliedo
Linate
Ghedi
Desenzano
Verona
R. Adige
R. Adda
R. Ticino
Aosta
Baraccamenti/Volpiano
Vercelli
Caselle
Casabianca
Venaria Reale
Aeritalia
TURIN
Mirafiori
Isabella Bridge
R. Po
Casale
Pavia
Port Albera
Sale
Voghera
Castel San Giovanni
Ulzio
Airasca/Pinerolo
Alessandria
Azzano d'Asti
Polonghera
Cavour
Novi Ligure
Saluzzo
Savigliano
Levaldigi/Centallo
Mondovi
Sampierdarena
GENOA
Varazza
Finale Ligure
Villanova/Albenga
Gallinaria Island
Alassio
San Remo
Piacenza/San Giorgio
Parma
Reggio Emilia
Modena
Borgo Val di Taro
Poggio Renatica
Ferrara
BOLOGNA
Pomposa
Rosolina
Marina di Ravenna
Lugo
Ravenna
Pavullo
Forli
Rimini
Spezia
Cadimare
Muggiano
Sarzana
Palmaria Island
Pistoia
Torre del Lago
Lucca
Peretola
Campo di Marte
Pisa
San Giusto
R. Arno
FIRENZE
Marina di Pisa
Pontedera
LIVORNO
Cecina
Arezzo
Siena/Pian del Lago
Siena/Malignano
Passignano
Castiglione
L. Trasimeno
Perugia
Campiglia/Venturina
Grosseto
Orvieto
L. Bolsena
Albinia
Terni
Foligno
Spoleto
Fano
Falconara
Iesi
Ancona
Loreto
Macerata
Fermo
Tortoreto
Pola/Ronzi Bay
Altura
Pola
San Caterina
Lussin Piccolo
Zara
Lagosta/Porto Lago
Bastia
Borgo
P.A.(North)
(West) P.A.
Fiume Secco

CLASSIFICATION Changed to UNCLASSIFIED

# ITALY

## AERODROMES AND LANDING GROUNDS

**SECRET**

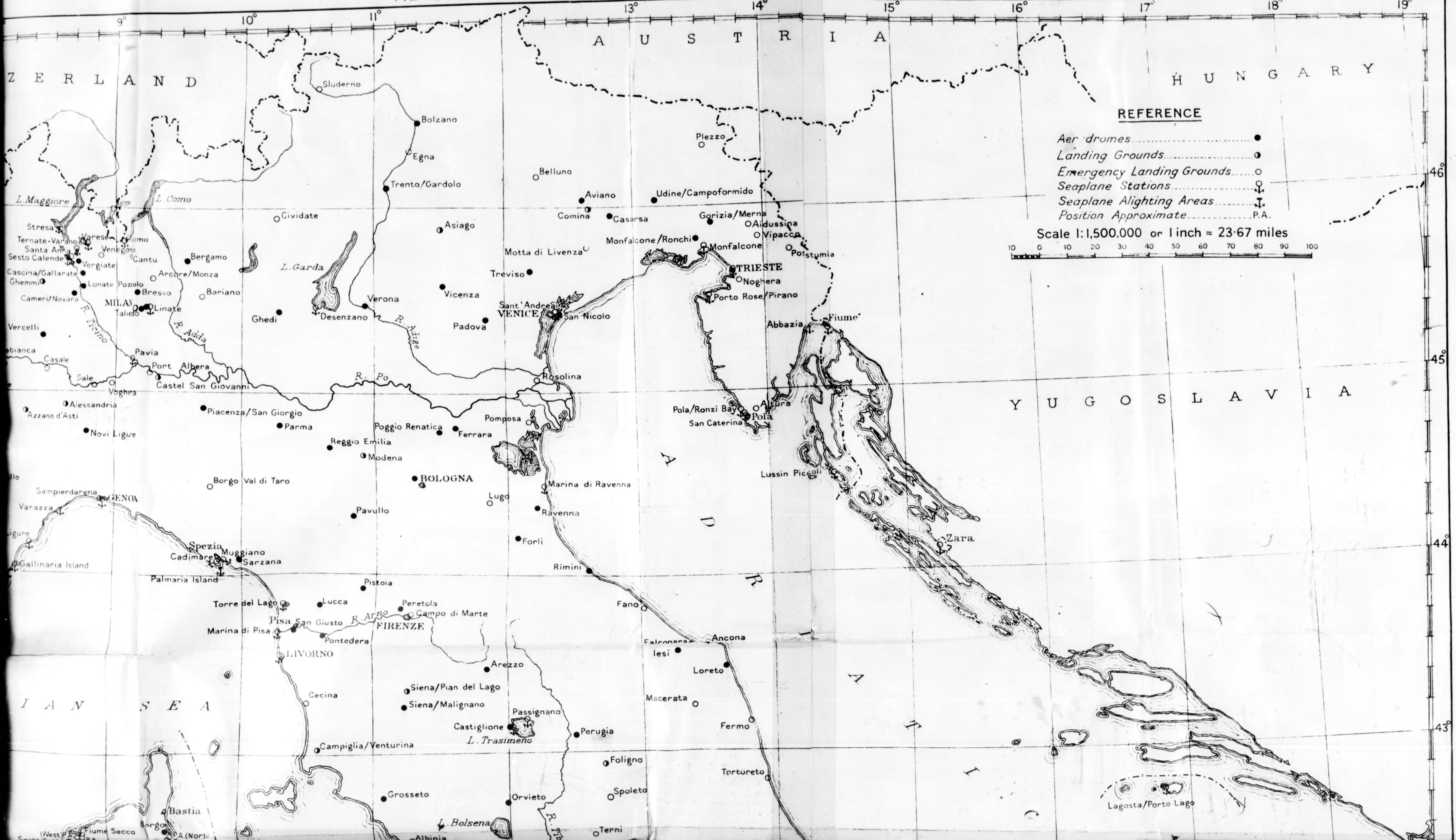

9°
10°
11°
13°
14°
15°
16°
17°
18°
19°
46°
45°
44°
43°
A U S T R I A
ZERLAND
H U N G A R Y
Y U G O S L A V I A
A D R I A T I C
IAN SEA
REFERENCE
Aerodromes ●
Landing Grounds ◑
Emergency Landing Grounds ○
Seaplane Stations
Seaplane Alighting Areas
Position Approximate P.A.
Scale 1:1,500,000 or 1 inch = 23·67 miles
10 0 10 20 30 40 50 60 70 80 90 100
Sluderno
Bolzano
Egna
Trento/Gardolo
Belluno
Plezzo
Aviano
Comina
Casarsa
Udine/Campoformido
Gorizia/Merna
Aidussina
Vipacco
Postumia
Monfalcone/Ronchi
Monfalcone
TRIESTE
Noghera
Porto Rose/Pirano
Abbazia
Fiume
L. Maggiore
L. Como
Stresa
Varese
Ternate-Varano
Santa Anna
Sesto Calende
Venegono
Como
Cantu
Vergiate
Cascina/Gallarate
Ghemmi
Lonate Pozzolo
Arcore/Monza
Bergamo
Cividate
Asiago
L. Garda
Bresso
Bariano
Cameri/Novara
MILAN
Taliedo
Linate
Ghedi
Desenzano
Verona
Vicenza
Motta di Livenza
Treviso
Sant'Andrea
VENICE
San Nicolo
Padova
R. Adige
R. Ticino
R. Adda
Vercelli
Casale
Pavia
Port Albera
Sale
Voghera
Castel San Giovanni
R. Po
Rosolina
Alessandria
Azzano d'Asti
Novi Ligure
Piacenza/San Giorgio
Parma
Reggio Emilia
Modena
Poggio Renatico
Ferrara
Pomposa
BOLOGNA
Borgo Val di Taro
Marina di Ravenna
Lugo
Ravenna
Pola/Ronzi Bay
Altura
Pola
San Caterina
Lussin Piccoli
Zara
Sampierdarena
GENOA
Varazza
Pavullo
Forli
Rimini
Spezia
Cadimare
Muggiano
Sarzana
Gallinaria Island
Palmaria Island
Pistoia
Torre del Lago
Lucca
Peretola
Campo di Marte
Pisa
San Giusto
R. Arno
FIRENZE
Marina di Pisa
Pontedera
LIVORNO
Fano
Falconara
Ancona
Iesi
Loreto
Arezzo
Siena/Pian del Lago
Siena/Malignano
Cecina
Macerata
Passignano
Castiglione
L. Trasimeno
Perugia
Fermo
Campiglia/Venturina
Foligno
Tortureto
Grosseto
Spoleto
Orvieto
Bastia
Borgo
Fiume Secco
P.A. (North)
L. Bolsena
Albinia
Terni
Lagosta/Porto Lago

CLASSIFICATION
Changed to
UNCLASSIFIED

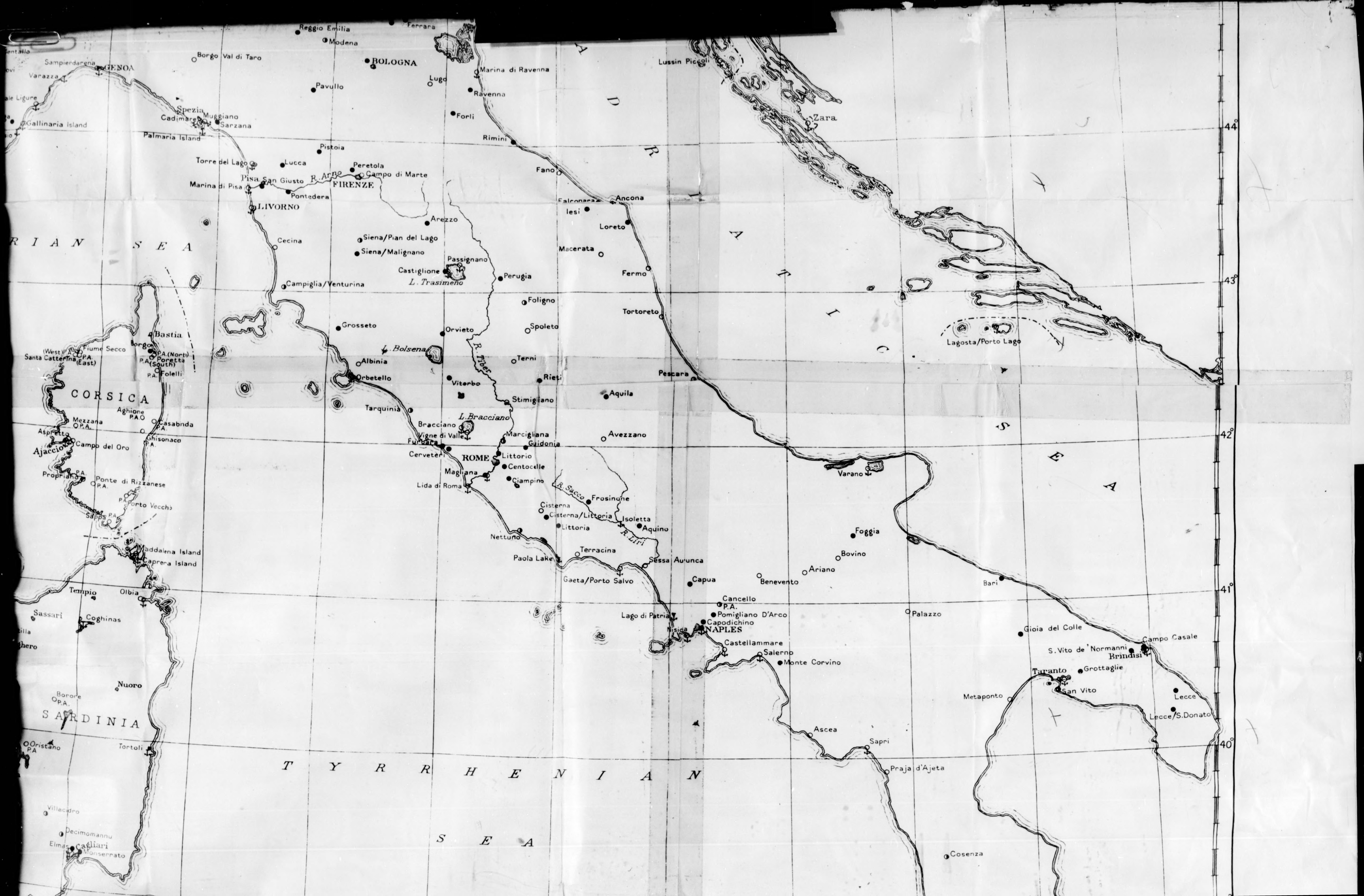
# ITALY

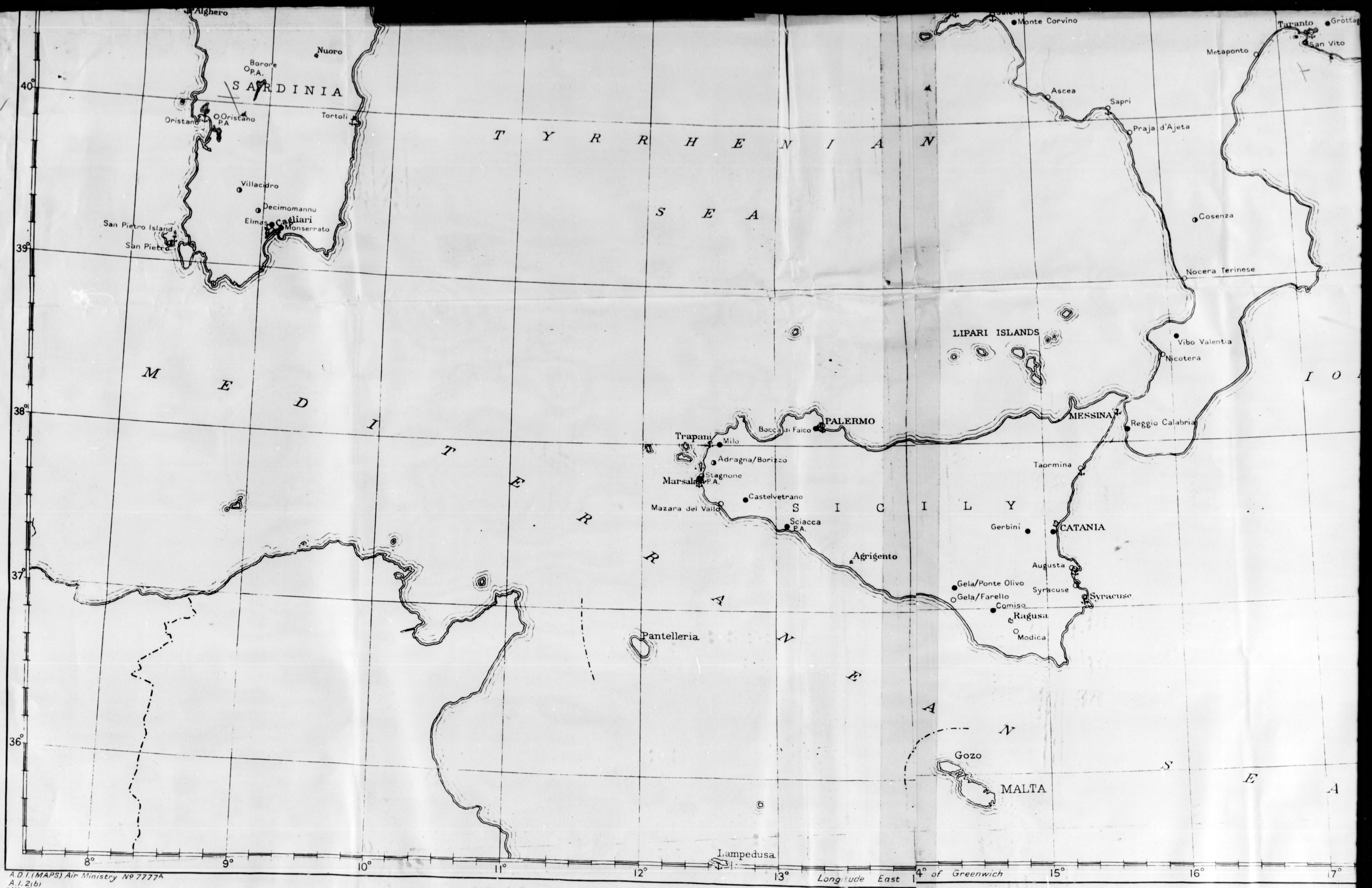
## AERODROMES AND LANDING GROUNDS

**SECRET**

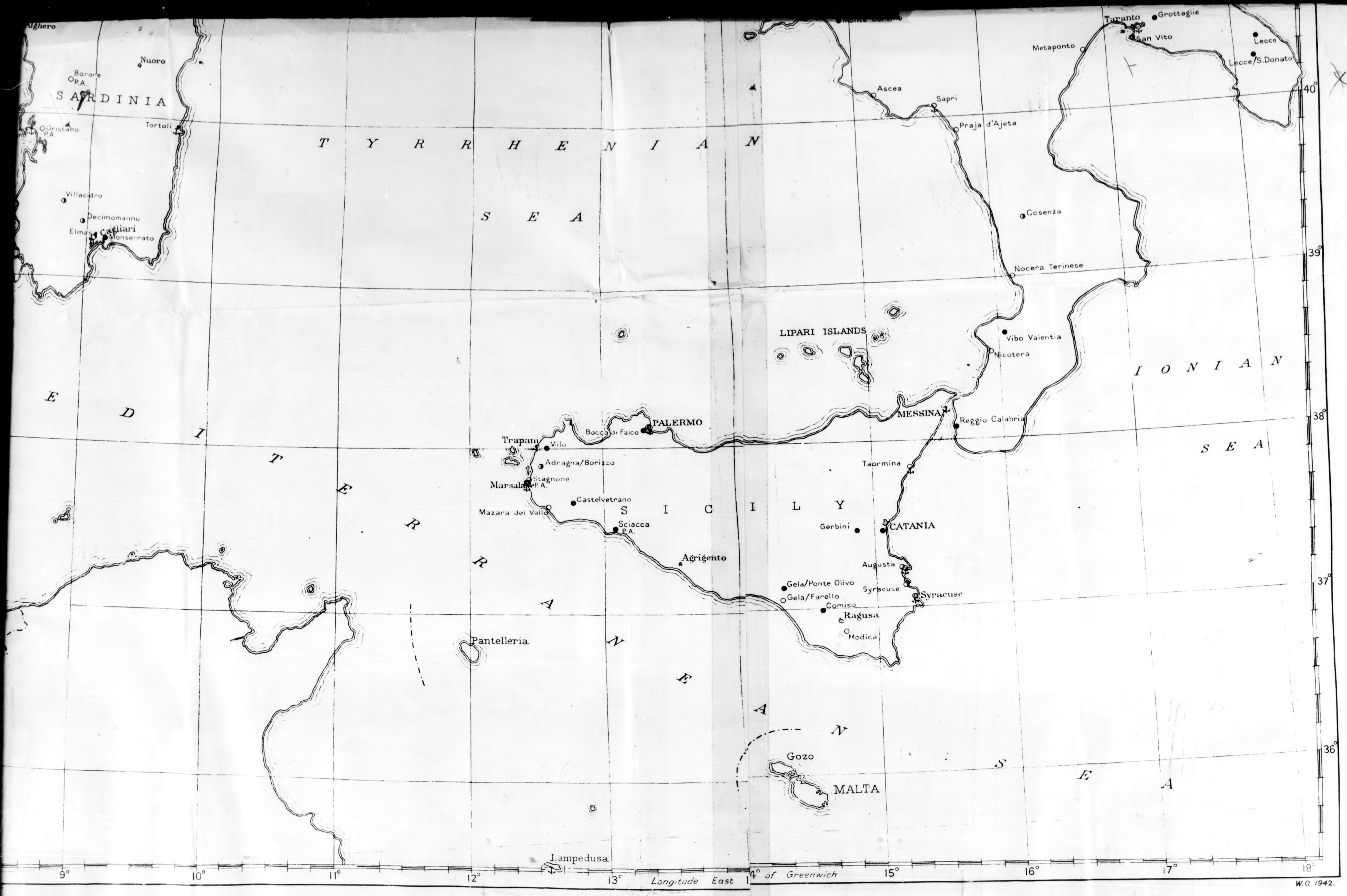

REFERENCE
Aerodromes ●
Landing Grounds ◐
Emergency Landing Grounds ○
Seaplane Stations
Seaplane Alighting Areas
Position Approximate P.A.
Scale 1:1,500,000 or 1 inch = 23·67 miles
10 0 10 20 30 40 50 60 70 80 90 100
9° 10° 11° 13° 14° 15° 16° 17° 18° 19°
46° 45° 44° 43°
AUSTRIA
HUNGARY
ZERLAND
YUGOSLAVIA
ADRIATIC
IAN SEA
L. Maggiore
L. Como
L. Garda
L. Trasimeno
L. Bolsena
R. Ticino
R. Adda
R. Adige
R. Po
R. Arno
Sluderno
Bolzano
Egna
Trento/Gardolo
Belluno
Aviano
Comina
Casarsa
Udine/Campoformido
Plezzo
Gorizia/Merna
Aidussina
Vipacco
Postumia
Monfalcone/Ronchi
Monfalcone
TRIESTE
Noghera
Porto Rose/Pirano
Abbazia
Fiume
Pola/Ronzi Bay
San Caterina
Pola
Altura
Lussin Piccoli
Zara
Lagosta/Porto Lago
Motta di Livenza
Treviso
Asiago
Vicenza
Padova
Sant' Andrea
VENICE
San Nicolo
Verona
Desenzano
Ghedi
Cividate
Bergamo
Arcore/Monza
Bariano
Stresa
Ternate-Varano
Varese
Santa Anna
Sesto Calende
Venegono
Como
Cantu
Vergiate
Cascina/Gallarate
Ghemmi
Lonate Pozzolo
Bresso
Cameri/Novara
MILANO
Taliedo
Linate
Vercelli
abianca
Casale
Sale
Voghera
Pavia
Port Albera
Castel San Giovanni
Alessandria
Azzano d'Asti
Novi Ligure
Piacenza/San Giorgio
Parma
Reggio Emilia
Modena
Poggio Renatica
Ferrara
Pomposa
Rosolina
BOLOGNA
Borgo Val di Taro
Lugo
Marina di Ravenna
Ravenna
Pavullo
Forli
Rimini
Fano
Falconara
Ancona
Iesi
Loreto
Macerata
Fermo
Tortoreto
llo
Sampierdarena
GENOA
Varazza
Ligure
Gallinaria Island
Spezia
Cadimare
Muggiano
Sarzana
Palmaria Island
Torre del Lago
Lucca
Pistoia
Peretola
Campo di Marte
FIRENZE
Pisa
San Giusto
Marina di Pisa
Pontedera
LIVORNO
Arezzo
Siena/Pian del Lago
Siena/Malignano
Cecina
Passignano
Castiglione
Perugia
Campiglia/Venturina
Foligno
Spoleto
Grosseto
Orvieto
Terni
Albinia
Bastia
Borgo
Fiume Secco
CA (Norbi)

Saluzzo
Levaldigi/Centallo
Mondovi
Sampierdarena
GENOA
Varazza
Finale Ligure
Villanova/Albenga
Gallinaria Island
Alassio
San Remo
Modena
Borgo Val di Taro
BOLOGNA
Lugo
Pavullo
Spezia
Cadimare
Muggiano
Sarzana
Palmaria Island
Pistoia
Torre del Lago
Lucca
Peretola
Campo di Marte
Pisa
San Giusto
R. Arno
FIRENZE
Marina di Pisa
Pontedera
LIVORNO
San Caterina
Marina di Ravenna
Ravenna
Forli
Rimini
Lussin Piccolo
Zara
A D R I A T I C S E A
Fano
Falconara
Ancona
Iesi
Loreto
Macerata
Fermo
Tortoreto
Lagosta/Porto Lago
Pescara
44°
43°
42°
41°
40°
39°
L I G U R I A N S E A
Arezzo
Cecina
Siena/Pian del Lago
Siena/Malignano
Passignano
Castiglione
L. Trasimeno
Perugia
Campiglia/Venturina
Foligno
Spoleto
Grosseto
Orvieto
L. Bolsena
R. Tiber
Terni
Rieti
Albinia
Orbetello
Viterbo
Aquila
Stimigliano
Bastia
Borgo
P.A. (Nort)
Poretta
P.A. (South)
Folelli
P.A.
(West) P.A.
Fiume Secco
P.A. (East)
Santa Catterina
CORSICA
Aghione P.A.
Casabinda P.A.
Mezzana O.P.A.
Aspretto
Ghisonaccia P.A.
Campo del Oro
Ajaccio
P.A.
Propriano
Ponte di Rizzanese P.A.
P.A.
Porto Vecchio
Sappa P.A.
Tarquinia
Bracciano
L. Bracciano
Vigne di Valle
Furbara
Cerveteri
ROME
Marcigliana
Guidonia
Littorio
Centocelle
Magliana
Ciampino
Lida di Roma
Avezzano
R. Sacco
Frosinone
Cisterna
Cisterna/Littoria
Littoria
Isoletta
Aquino
R. Liri
Nettuno
Paola Lake
Terracina
Sessa Aurunca
Gaeta/Porto Salvo
Varano
Foggia
Bovino
Ariano
Benevento
Capua
Cancello P.A.
Pomigliano D'Arco
Capodichino
Lago di Patria
Nisida
NAPLES
Castellammare
Salerno
Monte Corvino
Palazzo
Bari
Gioia del Colle
S. Vito de' Norma
Taranto
Grottag
San Vito
Metaponto
Ascea
Sapri
Praja d'Ajeta
Cosenza
T Y R R H E N I A N S E A
Maddalena Island
Caprera Island
Tempio
Olbia
Sassari
Coghinas
Fertilla
Porto Conte
Alghero
Nuoro
Borore P.A.
S A R D I N I A
Oristano
Oristano P.A.
Tortoli
Villacidro
Decimomannu
Elmas
Cagliari
Monserrato
San Pietro Island
San Pietro

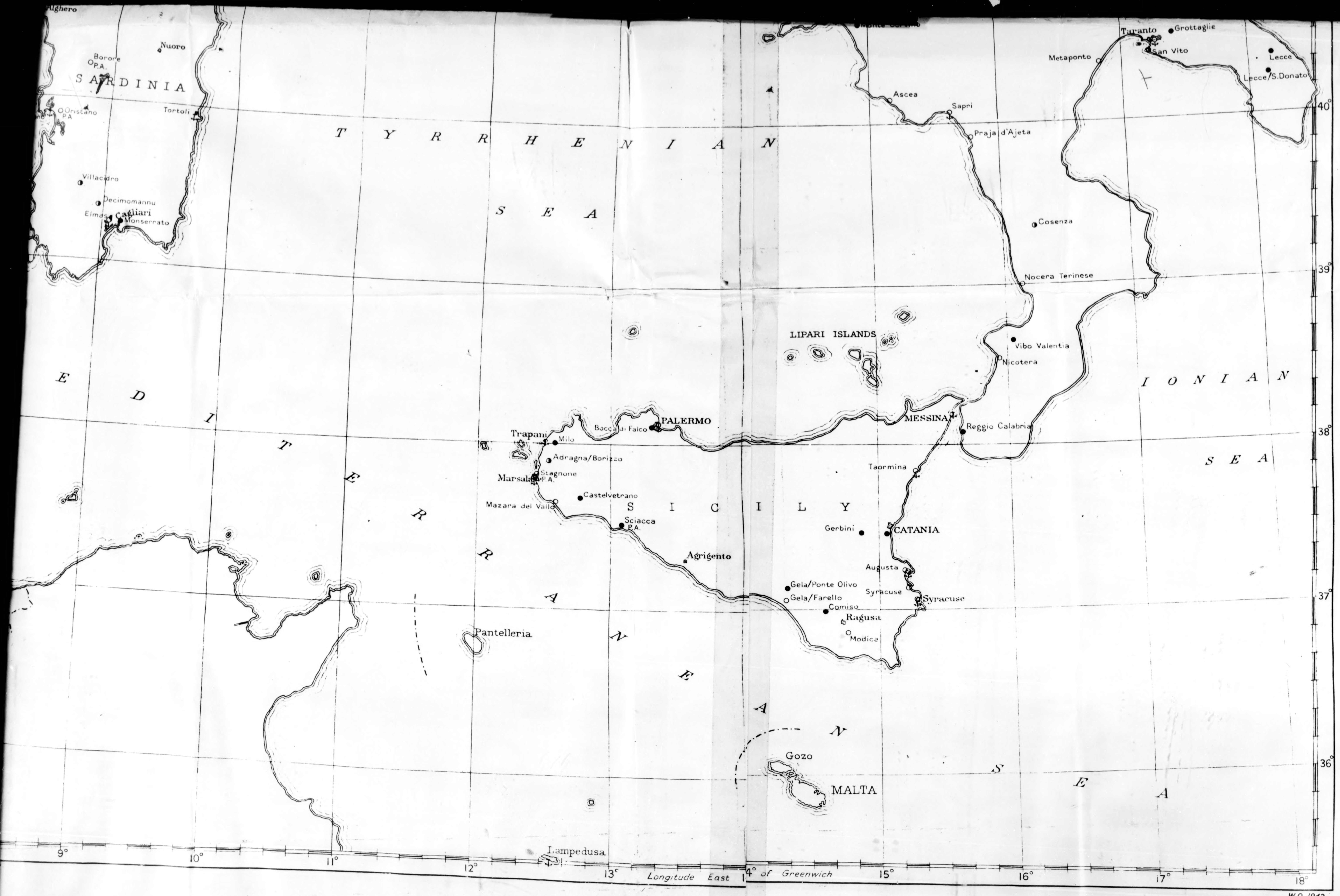

Reggio Emilia
Ferrara
Modena
Borgo Val di Taro
BOLOGNA
Sampierdarena
GENOA
Varazza
Lugo
Marina di Ravenna
Ravenna
Pavullo
Forli
Lussin Piccolo
Zara
Spezia
Muggiano
Cadimare
Sarzana
Gallinaria Island
Palmaria Island
Rimini
Pistoia
Torre del Lago
Lucca
Peretola
Pisa
San Giusto
R. Arno
Campo di Marte
Marina di Pisa
FIRENZE
Pontedera
Fano
LIVORNO
Falconara
Iesi
Ancona
Arezzo
Loreto
Cecina
Siena/Pian del Lago
Siena/Malignano
Macerata
Passignano
Castiglione
L. Trasimeno
Perugia
Fermo
Campiglia/Venturina
Foligno
Tortoreto
Grosseto
Spoleto
Orvieto
Bastia
Borgo
Fiume Secco
P.A. (Nort)
Santa Catterina
P.A. (East)
Poretta
P.A. (South)
Folelli
L. Bolsena
Albinia
Terni
R. Tiber
Orbetello
Viterbo
Rieti
Pescara
Lagosta/Porto Lago
CORSICA
Aghione
P.A.O
Tarquinia
Stimigliano
Aquila
Mezzana
P.A.
Casabnda
L. Bracciano
Bracciano
Aspretto
Ghisonaco
Vigne di Valle
Marcigliana
Avezzano
Ajaccio
Campo del Oro
Furbara
Guidonia
Cerveteri
ROME
Littorio
Propriano
Ponte di Rizzanese
Magliana
Centocelle
Ciampino
Lida di Roma
R. Sacco
Frosinone
Varano
Porto Vecchio
Sappa
Cisterna
Cisterna/Littoria
Isoletta
Littoria
Aquino
R. Liri
Foggia
Maddalena Island
Nettuno
Caprera Island
Terracina
Bovino
Paola Lake
Sessa Aurunca
Ariano
Gaeta/Porto Salvo
Capua
Benevento
Bari
Tempio
Olbia
Cancello
Sassari
Coghinas
Lago di Patria
Pomigliano D'Arco
Palazzo
Capodichino
Nisida
NAPLES
Gioia del Colle
Castellammare
Campo Casale
S. Vito de' Normanni
Brindisi
Salerno
Monte Corvino
Grottaglie
Taranto
Nuoro
San Vito
Metaponto
Lecce
Borore
Lecce/S. Donato
SARDINIA
Ascea
Oristano
Tortoli
Sapri
Praja d'Ajeta
TYRRHENIAN
SEA
ADRIATIC SEA
Villacidro
Decimomannu
Elmas
Cagliari
Monserrato
Cosenza
44°
43°
42°
41°
40°


Alghero
Nuoro
Borore P.A.
SARDINIA
Oristano
Oristano P.A.
Tortoli
Villacidro
Decimomannu
Elmas
Cagliari
Monserrato
San Pietro Island
San Pietro
TYRRHENIAN
SEA
MEDITERRANEAN
SEA
Monte Corvino
Taranto
Grottag
San Vito
Metaponto
Ascea
Sapri
Praja d'Ajeta
Cosenza
Nocera Terinese
LIPARI ISLANDS
Vibo Valentia
Nicotera
IO
MESSINA
Reggio Calabria
PALERMO
Bocca di Falco
Trapani
Milo
Adragna/Borizzo
Marsala
Stagnone P.A.
Castelvetrano
Mazara del Vallo
Sciacca P.A.
SICILY
Taormina
Gerbini
CATANIA
Agrigento
Augusta
Gela/Ponte Olivo
Gela/Farello
Syracuse
Syracuse
Comiso
Ragusa
Modica
Pantelleria
Gozo
MALTA
Lampedusa
40°
39°
38°
37°
36°
8°
9°
10°
11°
12°
13°
Longitude East
14° of Greenwich
15°
16°
17°

*A.D.I.(MAPS) Air Ministry Nº 7777A*
*A.I.2(b)*
14th February 1942
O.R. 1283.


Alghero
Nuoro
Borore
P.A.
Oristano
P.A.
SARDINIA
Tortoli
Villacidro
Decimomannu
Elmas
Cagliari
Monserrato
Ascea
Sapri
Praja d'Ajeta
Taranto
Grottaglie
San Vito
Metaponto
Lecce
Lecce/S.Donato
40°
T Y R R H E N I A N
S E A
Cosenza
Nocera Terinese
39°
LIPARI ISLANDS
Vibo Valentia
Nicotera
I O N I A N
S E A
M E D I T E R R A N E A N
S E A
PALERMO
Bocca di Falco
MESSINA
Reggio Calabria
38°
Trapani
Milo
Adragna/Borizzo
Stagnone
P.A.
Marsala
Castelvetrano
Mazara del Vallo
S I C I L Y
Taormina
Sciacca
P.A.
Gerbini
CATANIA
Agrigento
Augusta
Gela/Ponte Olivo
Gela/Farello
Syracuse
Syracuse
Comiso
Ragusa
Modica
37°
Pantelleria
Gozo
MALTA
36°
Lampedusa
9°
10°
11°
12°
13°
Longitude East
14° of Greenwich
15°
16°
17°
18°

W.O. 1942.


Alghero
Nuoro
Bonorva
P.A.
SARDINIA
Oristano
P.A.
Tortoli
Villacidro
Decimomannu
Elmas
Cagliari
Monserrato
T Y R R H E N I A N
S E A
Taranto
Grottaglie
San Vito
Metaponto
Lecce
Lecce/S.Donato
Ascea
Sapri
Praja d'Ajeta
Cosenza
Nocera Terinese
LIPARI ISLANDS
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I O N I A N
S E A
M E D I T E R R A N E A N
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PALERMO
Bocca di Falco
Trapani
Milo
Adragna/Borizzo
Stagnone
Marsala
P.A.
Castelvetrano
Mazara del Vallo
Sciacca
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S I C I L Y
Agrigento
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Reggio Calabria
Taormina
Gerbini
CATANIA
Augusta
Syracuse
Syracuse
Gela/Ponte Olivo
Gela/Farello
Comiso
Ragusa
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Longitude East
14° of Greenwich
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W.O. 1942.